EFFECTIVENESS OF ONLINE CLASSES IN TRAINING PROSPECTIVE SPEECH-LANGUAGE PATHOLOGISTS AND AUDIOLOGISTS

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September, 2021

CERTIFICATE

This is to certify that this dissertation entitled **'Effectiveness of Online classes in Training Prospective Speech Language Therapists and Audiologists'** is a bonafide work submitted in part fulfillment for degree of Master of Science (Audiology) of the student Registration number: 19AUD021. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysuru

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CERTIFICATE

This is to certify that this dissertation entitled **'Effectiveness of Online classes in Training Prospective Speech Language Therapists and Audiologists'** has been prepared under my supervision and guidance. It is also certified that this dissertation has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled **'Effectiveness of Online classes in Training Prospective Speech Language Therapists and Audiologists'** is the result of my own study under the guidance of Dr. Sandeep M, Associate Professor, All India Institute of Speech and Hearing, Mysuru, and is not submitted to any other University for the award of any other Diploma or Degree.

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Chapter 1

INTRODUCTION

Education paves the way to a well-civilized society. The importance of education is undeniable and is vital that we cannot compromise. There are numerous platforms to achieve and access knowledge and skillset in today's digital age. Arguably virtual platform has made our life a lot easier, comforting, intriguing, demanding and accessible. Technology has set roots in all disciplines and practices at a swift pace.

Prensky (2010) contends that every aspect of life in our culture is changed by digital technologies, which implies that it will inevitably change how we deliver educational instruction as well. On the contrary, Palfrey and Gasser (2008) advise educators not to abandon the best of what they have been doing for centuries and turn to technology for its own sake, but rather "figure out, instead, how the use of technologies can support our pedagogical goals". There are global and central initiatives from both government and private sectors to access online quality learning and opportunities to offer and educate students, breaking the barriers. Its focus entails (a) those who are unable to attend traditional face-to-face offerings, (b) cost-efficiently assembling and disseminating instructional content, or (c) enabling instructors to handle more students while maintaining learning outcome quality that is equivalent to that of comparable face-to-face instruction (Means et al., 2009). E-learning set its early roots with distance mode of learning in correspondence courses and open universities. It is noteworthy that it does require some extent of technological sophistication to build a platform in a system like India to accomplish these agendas (Gupta, 2013; Kundu, 2014; Lim, 2020), although Forbes survey in 2019 ranks, India's Internet cost as being the lowest compared with other countries

(Agrawal et al., 2020). However, online learning education is mainstreaming, and gradually, its market is expanding (Gallagher & LaBrie, 2012; Kulshrestha & Kant, 2013).

Several studies have compared online teaching with traditional teaching. Nguyen (2015) found strong evidence to suggest that online learning is at least as effective as the conventional format. Sathish et al. (2020) concluded that online teaching is better than the traditional method but is time-consuming at the same time for teachers. On the contrary, Bailey (2012) showed that students are significantly more satisfied with face-to-face teaching than fully online courses. Hsu (2004), in a survey of in-service teachers at Ohio State University, revealed several issues inherent to online learning, especially multiculturalism. The effectiveness of online learning approaches appears quite broad across different content and learner types: The elements such as video or online quizzes do not influence the amount that students learn in online classes (Means et al., 2009). In terms of collaborative learning relationships, Gillingham and Molinari (2012) found that respondents rated their interactions with their instructor more favourably than their peer interactions.

A review of evidence-based practices in online learning (Adam et al., 2009; Means et al., 2010) has shown that online with blended educational approaches had better outcomes than solely face-to-face interaction methods. Blended learning is reported to be more effective than non-blended instruction for knowledge acquisition in health professions (Liu et al., 2016).

Recently, the global pandemic (COVID19) has caused outrage and anxiety among the student community. In due regard, the government provided standard operating procedures to conduct online and facilitative-based teachings to restrict community spread among students (Lederman, 2020; Gonzalez et al., 2020).

Considering the need of the hour, all government and private education sectors of various disciplines have continuously made efforts to find the most viable option to ensure optimal learning in students (Zhang et al., 2020). Hence, the online mode, which offers ample alternative platforms, has been considered to be the best option to conduct classes (Dutta, 2020; Khan, 2020; Pandey et al., 2020; Martinez, 2020), replacing conventional teaching methods. Thereby, the conduction of classes through online mode minimizes any requirement of social contact, renders virtual student community and attempts to impact education. The viral outbreak prompts us to redefine the learning and teaching methods; 'Emergency Remote Teaching (ERT)' differs from distance learning. The latter considers pedagogical resources and methods and is well structured specifically to the subject. The widely used term- 'electronic learning' or 'e-learning' is interchangeably used with the distinct label- 'Online Learning'. It is indeed a challenge to meet online learning objectives, as stated in the articles published recently (Khan, 2020; Aldhahi et al., 2021; Kumar et al., 2021).

1.1 Justification for the Study

It is essential to understand that there are prominent influencing factors in making online learning an academically efficient and satisfactory experience for the students and teachers. The primary objectives of online classes would be: to build an optimum virtual-classroom environment; evolve with the teaching and learning methods; affordability, availability and use of technological gadgets (Khan, 2020); create a competitive academic edge; and cultivate a self–learning attitude among students. The students and teachers' attitudes are critical in making online learning more efficient and satisfactory (Lim, 2020; Sokal, 2020).

In terms of higher education, in professional courses like Speech and Hearing

Sciences, training prospective speech-language pathologists and audiologists at the graduate and postgraduate levels are demanding. It requires a lot of motivation, commitment, dedication, and most importantly, self–directed learning attitude by the students and the acquisition of clinical skillset. Like all other institutions, speech and hearing institutions had to adapt quickly to the pandemic and start with the online teachings. Both teachers, as well as students, were naive to the modality.

Although some earlier studies have shown that the online training modality is comparable to the traditional teaching method, it is predicted that the online training modality will compromise the quality of education among students. The probable reason could be the deprivation of hands-on training in lab work and clinical experience. Only a few investigations are done on the effectiveness of online classes in the relatable professional fields. According to Khalil et al. (2020), online modality was well-received by Saudi Arabian medical students agreeing that online sessions saved time and that their performance improved as a result of increased time utility. However, they indicated that they faced some challenges during sessions and online exams, including methodological, content perception, technical, and behavioural issues.

In a recent survey of 983 medical students (MBBS, BDS, & other allied courses), it was concluded that e-education could supplement the process of education, but it cannot substitute for the established education system (Kaur et al., 2020). It is important to note that the change in modality should not compromise the training standards.

Therefore, the present study aimed to assess the efficacy of online classes in speech and hearing programs. The study also intends to identify the challenges faced by the students with online classes and suggest possible ways to overcome the same.

It also offers opportunities for students to provide their feedback on academic and personal aspects with regard to online teachings.

1.2 Aim of the Study

The aim of the study was to assess the effectiveness of online classes in Speech and Hearing programs, as perceived by prospective Speech Language Pathologists and Audiologists, identify the barriers, if any, and assess the effect on health.

1.3 Objectives of the Study

The three objectives of the study were to

1. assess the effectiveness of online classes in meeting the learning objectives of theory, practical and clinical training.
2. determine the barriers of online-learning, perceived by the students.
3. compare the difference between bachelors and master's students for their perception on the effectiveness of online classes, barriers, effect on health and psychological attributes, and the preferred modality for learning.

Chapter 2

REVIEW OF LITERATURE

In the recent past, online classes became inevitable, drastically altering the process of teaching and learning. Its development is rooted in the ideals of the generation of high-quality education by facilitating knowledge transfer without demographic, geographical and economic constraints. Online education is an excellent alternative for students looking for malleable options and can be considered an alternative supplement to enhance traditional education. This chapter reports the literature relevant to online learning under the following headings:

1) E-learning and distance education

2) Online classes during the pandemic

3) Online classes: Teachers' perspectives

4) Online classes: Students' perspectives

2.1 E-learning and Distance Education

Massive Open Online Courses (MOOCs) is a platform offering distance education, examples of it being viaedX, Udemy, Coursera, Moodle, Swayam, Versal and Class2Go. It started as an experiment utilizing emerging pedagogical models for peer-assessment techniques and to expand courses to support an indefinite number of learners. Thakur (2018) reported that online or computer-based courses builds self-confidence, knowledge and encourages students to take responsibility for their learning. He also reported that E-Learning enables more interaction among students and instructors than extensive lecture courses. Arinto (2016) recommended the following for efficient teaching-learning in the online modality (1) to encourage unengaged faculty to actively take part in innovative practices-by addressing faculty

indifference and time constraints (Mansour et al., 2004) (2) to support and sustain innovative practices, which can be achieved by guidance and technical support, taking students' input to design, addressing diverse student backgrounds and involving students as co-creators. Hossain et al. (2015) studied the effectiveness of MOOC program in physiotherapy students of Bangladesh. Participants attended a self-paced five weeks program to treat patients with spinal cord injuries. The primary outcome as reported in the study was improved knowledge, and the secondary outcomes were perceived confidence to treat patients and satisfaction with the learning experience.

The learning in the virtual mode is reported to be same as that in a classroom setting, irrespective of the platform being high-tech, interactive or not (Nguyen, 2015; Satish et al., 2020; Zhang et al., 2020). Sandlin (2013) reported that distance education is more effective than face-to-face training as it adopts newer technology that can enhance and maximize the effectiveness of training.

However, emergency remote education is different from distance education as the latter does not apply pedagogical aspects during the emergency. Distance education is a planned activity, and its implementation is grounded in theoretical and practical knowledge specific to the field and its nature. In contrast, emergency remote education is about surviving in a time of crisis with the available resources, including offline and/or online (Bozkurt & Sharma, 2020).

2.2 Online Classes during the Pandemic

In light of the global pandemic, institutions worldwide adapted Emergency Remote Teaching (ERT), requiring to implement quality education to be delivered via alternative platforms (Palvia et al., 2018). In ERT, it becomes challenging to provide the students high-quality experiences using the alternative modalities (Bozkurt & Sharma, 2020; Westine et al., 2019), as neither students nor staff are prepared for it.

Although face-to-face interaction is vital for developing interpersonal bonds that technology cannot replace (Devine et al., 2020), it is reasonable to presume that the current online platforms are the new normal in education under the COVID19 situation (Tria, 2020).

The greatest obstacle for instructors is to connect with their students and create the constructive learning environment to engage them (Alvarez, 2020; Duncan & Young, 2009). First time distance learning teachers are concerned with technological literacy as well as pedagogical skills (Kayaduman & Demirel, 2019; Bhaumik & Priyadarshini, 2020). But in poor and developing countries there are no apriori plans to train teachers, students, and parents in Information and Communication Technologies. Nevertheless, they learn to adapt with the technological skills required for E-learning and teaching.

2.3 Online Classes: Teachers' Perspective

Miller (2014) identified six principles for effective instruction: peer-to-peer interaction, active student engagement in learning, emphasis on practice and student effort, personalization, and differentiation. Kebritchi et al. (2017) determined intrinsic motivators that can positively influence instructors, such as flexible schedule and self-satisfaction. Samra et al. (2021) studied 135 dental science faculty members using a descriptive questionnaire with two surveys. The first survey comprised sociodemographic, designation, teaching experience, online teaching practices, perceptions, and challenges faced during online teaching during the first wave of the COVID-19. The second survey was conducted using the same questionnaire on the same participants to see how effectively they overcame their problems during the second wave. According to the findings, 67% of participants spent more time preparing for their courses, 62% experienced network issues, and 53% spent more

money on data. The majority of the difficulties encountered were due to students' attitudes, which lowered the quality of the lectures. Seventy-four percent of teachers agreed that online instruction was more effective than traditional instruction for theoretical learning. The faculty members reported that few difficulties faced during the first lockdown got rectified, by second lockdown. However, network connectivity and students' attitude remained an issue. ERT was found to impact teachers' ability to support hands-on training to students who have uneven access to tools, materials, and resources. This in turn impacted student motivation and engagement. Henceforth, it demands a pedagogical paradigm shift to allow all online teaching and learning activities using ERT practices (Hodges et al., 2020; Code et al., 2020).

Almazova (2020) reported that teachers' readiness for online teaching and learning is primarily determined by their computer literacy skills and ability to effectively use information and communication technologies in the educational process. Further, in order to ensure online classes, it is necessary to ensure uninterrupted electricity as well as a good internet connection to the students and teachers (Zounek & Sudicky, 2012; Pustika, 2020; Agung, 2020; Farooq et al., 2020).

The effectiveness of online education may vary based on the subjects (Arkorful & Abaidoo, 2014), but, does not depend on teachers' designation and demographic background (Mailizar et al., 2020)). Elshami et al. (2021) found that the online education increased workload of faculty: consumed more time to prepare for teaching and assessment materials.

2.4 Online Classes: Students' Perspective

Radha et al. (2020) found that, when given an opportunity, 100% of International students opted for e-learning while only 80% of Indian students opted for it. Seventy-three percent of undergraduates expressed their satisfaction with web-

based mock test participation and that their self-study skills improved through e-learning. Researchers concluded that students have positive attitudes toward e-learning.

Aldhahi et al. (2021) surveyed 1226 students medical and non-medical students and found that 51% were highly satisfied with E-learning while the rest indicated low satisfaction. High satisfaction was reported in domains such as time management, technology, and learning. Similar findings were reported by Coman et al. (2020) and Shahrvini et al. (2020) in Romanian and American universities respectively. The loss of practical experience, strong feelings of anxiety and isolation were reported as the demerits of e-learning, while the ability to tackle technical issues by using alternative platforms, opportunities to explore different learning resources and spare time to focus on well-being were reported as the merits.

Mansour et al. (2007) assessed for students' positive and negative experiences in hybrid and online courses. They found flexibility in the class schedule and the instructor's availability as positive experiences of hybrid course (a combination of online and face-to-face teachings), whereas convenience, instructor availability, and online interactions as positive experiences of online course. Technological setbacks and a feeling of lost in cyberspace were the negatives in online as well as hybrid classes. Based on these findings, Mansour et al. (2019) used a novel hybrid pedagogical model that integrated team-based and case-based learning interactions. This model was reported to have improved academic performance in both summative and formative assessments.

A review by Biswas and Debanth (2020) showed that e-learning divides students into privileged and unprivileged groups in terms of access to technical gadgets and emphasized the importance of blended learning. Kumar et al. (2021)

found a significant relationship between the increasing levels of online learning readiness and student satisfaction, and also among attitude toward online classes and sociodemographic variables such as age, academic level, and family income.

Rotas and Cahapay (2020) found the following challenges encountered by Filipino university students: unstable internet connectivity, insufficient learning resources, power failures, ambivalent learning contents, overloaded lesson activities, limited teacher scaffolds, poor peer communication, conflict with home responsibilities, poor learning environment, physical health compromises, and mental health struggles and financial concerns. Ramij et al. (2020) investigated students with the same academic background (Bachelor of Business Studies) at eight different private universities in Bangladesh and found comparable results.

3.4.1 Efficacy of Online Classes for the Technical Courses

Gelles et al. (2020) interviewed 11 second-year Integrated Engineering students to explore how they adapted to remote learning. Results revealed challenges which were individual-specific, and focused on the three cross-cutting challenges: (a) increased workload, (b) inconducive learning environments, and (c) miscommunication. The students overcame these by using self-discipline strategies and support from the faculty in terms of adjusting the curriculum and assessment, offering flexible pedagogy and communicating effectively with students. Vintere et al. (2021) investigated the competence development of Estonian, Lithuanian and Latvian engineering students during the pandemic. Students faced personal competence, such as difficulty paying attention in online classes and motivation to finish assignments, and social competence, such as communication with the teacher and digital skills. The authors observed that Estonian students were more interactive than their other counterparts. Also, Lithuanians were reported to have the best digital skills to

use distance learning platforms and tools. They concluded that almost one-fourth of the students preferred remote studies based on the principles of self-directed learning.

Ouatik et al. (2021) attempted to implement remote laboratory and machine learning for practical works of electronics. This system was made available to target and analyze students' gaps, weaknesses, and lack of scientific knowledge in electrical engineering through data mining algorithms and students' study behaviour. They claimed that the algorithm correctly classifies the students as- Level unacceptable, Level insufficient, Level correct and Level excellent, with more than 90% accuracy when subjected to academic assessments under three criterias: Know-How, Experimental Know-How, and Know-How Editorials.

2.4.2 Efficacy of Online Classes for Medical Sciences

Online learning is a good alternative for traditional chinese medicine in instances when classroom learning is suspended, but it cannot replace face-to-face learning (Zhang et al., 2020). Likewise, Alsaywid et al. (2020) found similar opinions among Saudi Arabian medical residents.

In order to determine the crucial factors that influence students' preferences for a particular format, Stefanie et al. (2016) administered quantitative surveys and held open-ended interviews. Participants appreciated the advantages of the online format, like pace control, schedule, and flexibility of learning from archived materials. They reported that face-to-face environment is more conducive to attend lectures and laboratories because instructors would be able to hold their interest and be less distracted.

Korkmaz and Toraman (2021) surveyed 725 medical students and found that students with advanced computer, mobile phone, and tablet PC skills are better prepared for e-learning in terms of technological access and technical skills. The

authors concluded that in online learning environments, students tend to exhibit higher levels of knowledge sharing behaviour.

Jawaid and Ashraf (2012) found that 87.2% of 539 medical undergraduates from Karachi, rated the e-learning curriculum to be helpful and understandable. Students put-forward mixed opinions about the requirement of their computer skills for e-Learning modules. Verma et al. (2020) interviewed medical students about their perceptions of online teachings during the pandemic. Fifty-seven percent of students reported online classes to be safe, comfortable, and enjoyable. Ninety-two percent agreed that online classes are beneficial in terms of time management and that engaging in online learning reduced their stress about COVID19. Comparable findings were reported by Frydenberg (2021). The author also found that medical undergraduates showed an 84% persistence rate in completing a four-year or two-year formal degree at the University of California Irvine.

Drago et al. (2017) modified three online graduate programs to benefit medical and health professional programs from the traditional 15-week online course delivery model to a 7-week intensive model. The authors witnessed the new delivery model in course facilitation was efficient. The authors emphasized 'Collaborate', which is a blackboard feature that is similar to face-to-face class discussions where sessions can be recorded for those who were unable to attend. This type of synchronous interaction early in a course aids in the development of both teaching and social presences, which in turn aid in the development of the cognitive presence. Besides, Videocast lectures uploaded in advance, electronic health records and tele-health training for students, and training for teaching faculty to increase technological fluency can be considered to optimize remote learning curricula (Shahrvini et al., 2021).

Most second-year medical students expressed that their preparation for the United States Medical Licensing Examination was negatively affected, whereas 43% felt unprepared. Only 25% of respondents felt connected to the medical school or classmates, and feelings of anxiety and isolation were noted as negatives of remote learning (Elshami et al., 2021). Shahrvini et al. (2021) enlisted negatives of online classes to be digital fatigue causing, decreased ability to participate, lack of clinical skills, lack of laboratory, and limited hands-on training.

Attardi et al. (2016) reported that students faced difficulty using the 3D models in the online laboratory and preferred the exclusive hands-on experiences of cadaveric specimens. The authors suggested the need to improve the online experience by heightening the quality of student-instructor communication and, in a way, improving student-content interaction with the 3D models.

2.4.3 Efficacy of Online classes in Speech and Hearing Institutions

According to Samelli et al. (2020), Brazilian medical university educators prioritized sustaining teaching and training standards, despite changing into the virtual format. Authors found factors such as social isolation, a change in routine, increased domestic demands, and concern about viral contamination as negatives. Additionally, participants reported financial, socioeconomic situations, loss of family members, lack of a conducive home environment to study, and lack of or difficulty with technological resources as hindrances for online learning. Physical therapy, speech language hearing science, and occupational therapy undergraduates also faced similar challenges. The study reported that educators also struggled to adapt to available information and communication technology, as much as professors struggled to master this mode of instruction (Machado et al., 2020; Tempski et al., 2020; Chinelatto et al., 2020).

Overall, the review of literature shows that online learning in the current scenario has many challenges and demerits. Both students and teachers have adapted to the online mode in the emergency situation of pandemic, but it is not their preferred modality. Although aspects such as flexibility and time management are appreciated in the virtual mode, it is reported to be conducive only for learning theoretical concepts. There has been no direct attempt to evaluate the efficacy of online classes held in Speech and Hearing programs to date. Therefore, the current study appears to be essential and worthy of investigation. This research might be helpful for educators and decision-makers in making suitable and efficient planning in the curriculum for the future, considering the strengths and weaknesses of e-learning.

Chapter 3

METHODS

A cross-sectional survey (online) type of research was adopted for the study. A questionnaire was used to assess the students' perception of the effectiveness of online classes in Speech and Hearing programs. The research design aided in reaching a large number of participants in a cost-effective manner.

3.1 Participants

Students pursuing bachelor and Master's programs in Speech-Language Pathology and Audiology who met the inclusion criteria were recruited as participants. Table 3.1 shows the distribution of participants across class and gender. The study population comprised 282 bachelors and 206 masters students. The participants' age ranged from 18 to 29 years (Mean age = 22 years). The following were the inclusion and exclusion criteria.

Inclusion criteria

1) Currently studying in a RCI certified speech and hearing college or institution.
2) Attended/attending full-time online classes for the academic year 2020-2021 for a minimum of 3 months.
3) Students pursuing Bachelors of Audiology and Speech Language Pathology (BASLP), Masters in Audiology/ Speech-Language Pathology, and Masters in Audiology and Speech-Language Pathology (MASLP) programs.

Exclusion criteria

1) Students pursuing Diploma courses associated with speech and hearing discipline.

2) Students who are engaged in other corresponding professional courses at the same period.
3) Students pursuing Bachelors/ Masters of Education Special Education (B.Ed.Sp.Ed/ M.Ed.Sp.Ed).

Table 3.1: *Distribution of participants across class and gender (N=488)*

Course	Class	Males	Females	Total
BASLP	First year	28	91	119
	Second year	8	49	57
	Third year	23	83	106
MSc. Audiology	First year	15	25	40
	Second year	17	34	51
MSc. Speech	First year	2	17	19
Language Pathology	Second year	8	39	47
MASLP	First year	10	16	26
	Second year	7	16	23
Total		118	370	488

Note. BASLP- Bachelors of Audiology and Speech Language Pathology, MASLP- Masters Audiology and Speech language Pathology.

3.2 Procedure

A questionnaire was developed in English, keeping an unbiased perspective towards online teachings. The questionnaire constituted 32 statements with three open-ended questions. This was to surpass the rigidity of the questionnaire.

3.2.1 Development of the Questionnaire

The questionnaire was prepared on identifying crucial and appropriate

attributes influencing the efficacy of online classes. The inputs from the students were also considered while preparing the questionnaire. The attributes were divided into three main domains:

1) Effectiveness of online modality in building skill and knowledge
2) Barriers encountered for online learning
3) Influences on health and psychological attributes

The questionnaire addressed several aspects under the three domains: internet accessibility, students' ease with technology, better understanding of the concepts, balancing practical and theoretical classes, grooming professional career, assignment submission, and simulated classroom environment. It aimed to assess students' experiences with online learning, the differences between online and on-campus learning, difficulties encountered, challenges, level of satisfaction with online evaluation, and individual preferences.

A five-point rating Likert scale was used to measure the responses, which included two extreme opinions with one neutral opinion, where 1 referred to 'Strongly agree', 2 referred to 'Agree', 3 referred to 'Neutral', 4 referred to 'Disagree', 5 referred to 'Strongly Disagree'.

The statements prepared underwent further pooling and refining process: rewording, eliminating irrelevant questions and combine questions. The two faculty members of Audiology validated the developed questionnaire to ascertain its appropriateness. The corrections suggested were remediated in the final questionnaire. The final reviewed and approved questionnaire was pretested on 10 participants to cross-verify the limitations (like total response time required) and overcome linguistic, question order and response bias.

The online questionnaire was translated into a Google form. It consisted of

five sections as outlined in Table 3.2.

Table 3.2: *Number of statements/questions included under each section of the questionnaire*

Section	Name	No. of statements/ questions
I	Demographic details	9
II	Effectiveness of online modality	16
III	Barriers encountered	10
IV	Influence on Health and Psychological attributes	6
V	Short answers	3

Participant details such as age, gender, course, name of the instution where the course is being pursued, whether they are attending classes online, average number of hours of online classes attended, the platform used for attending online classes were collected in Section I (Demographic Details). Section II (Effectiveness of online modality) assessed the perceived effectiveness of the online classes in meeting the learning needs of the participants under sixteen specific attributes which were divided under theoretical, practical, and clinical training. Under Section III (Barriers encountered) Ten attributes were included to help determine the problems faced with internet and communication interfaces in online learning. Section IV included six attributes that influence the feelings, thoughts, and attitude towards online classes. Section V consists of three open ended questions to understand the participants' views on the preferred modality to attend classes.

3.2.2 Administration of the Questionnaire

Students from more than 33 recognized speech and hearing institutions across India and abroad who fulfilled the inclusion criteria were invited to participate in the

survey. The invitation link was sent to the participants via Whatsapp/ Gmail platforms. A virtual consent was obtained from the participants prior to attend survey. The study conformed to the ethical guidelines prescribed for bio-behavioral research at AIISH (Basavaraj and Venkatesan, 2009). The participation in the study was completely voluntary, and the confidentiality of the demographic and response data was ensured. The self-administered questionnaire included clear instructions at the beginning, using an illustrated example question to avoid any confusion among the participants. The instructions were stated as follows:

"Read the main statement and answer with respect to each attribute mentioned below. Give your opinion on a scale of 1 to 5; where, (1) Strongly agree (2) Agree (3) Neutral (4) Disagree (5) Strongly disagree Choose any one option that best indicates the extent to which you agree or disagree with the statement."

The complete questionnaire in the format (Google form) that was used for data collection is included in the Appendix. The response data collected using the same was exported to Microsoft Excel.

3.3Analysis

All the descriptive data were derived using Statistical Package for Social Science version 20 (SPSS) software. The response percentage was explicitly calculated for each attribute under the respective domain. The Shapiro- Wilk test was used to determine data distribution normally. Since assumption of normality was violated, non-parametric tests were carried out. To compare between two nominal categories (bachelors and masters), Mann-Whitney U test was used. In addition, Pearson chi-square test was conducted to test the association between preferred modality and class. The internal consistency of the response data was determined by calculating the Cronbach's alpha value.

Chapter 4

RESULTS

The study aimed to determine the effectiveness of online classes in Speech and Hearing programs, using a Likert rating scale. Four hundred eighty-eight students from 33 different speech and hearing institutions across India and three universities abroad participated in the survey. There were 282 bachelors and 206 masters students in the study sample. All the 488 responses were found valid and therefore were subjected to descriptive statistical analysis. Among the participants, 16% had the experience of attending online classes in the recent past, while the rest 84% had the past experience as well as were attending online classes every day during the survey study.

Figure 4.1 shows the number of days the participants attended online classes in a week. It shows that 48.8% of participants attended classes five days/week, and 33.8% attended six days a week. Less than 20% of the participants attended classes three or four days/week. Figure 4.2 shows the number of hours the participants attended the online classes in a day. The results show that the majority attended 3 to 5 hours of classes in a day, while a small percentage of them attended 6 hours or more in a day.

Figure 4.1: *Percentage of participants attending online classes shown against different frequency of classes expressed in number of days/week*

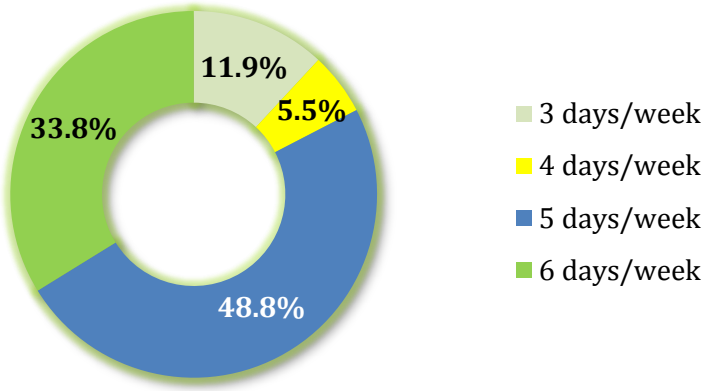


Figure 4.2: *Percentage of participants attending online classes shown against different frequency of classes expressed in number of hours/day*

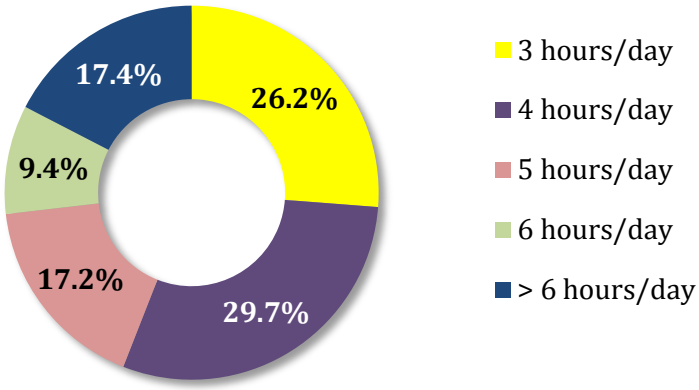
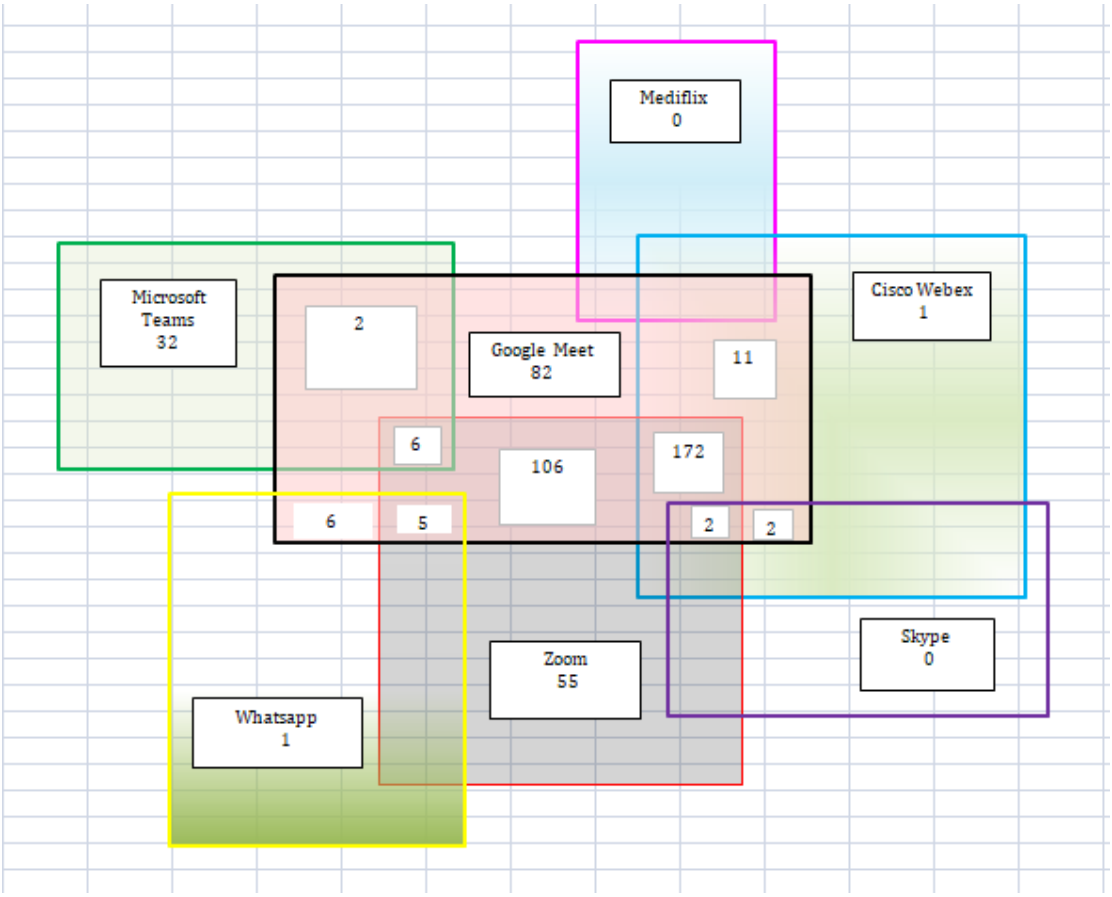


Figure 4.3 shows number of participants against the various online platforms they used to attend the classes. Seven different online platforms were used by the participants. The figure shows that the majority used a combination of platforms (317 participants) while the rest relied only on one platform (171). On comparing the various combinations of platforms used, a maximum number of participants (172) used Google Meet+Zoom+CiscoWebex. This was followed by Google Meet+Zoom (106 participants). In instances of only one platform being used, Google Meet was

used by most participants (82), followed by Zoom (55) and Microsoft Teams (32). The frequency of use of other online platforms was found to below.

Figure 4.3: *Number of participants against the various online platforms and combination of online platforms they used to attend the classes*



Note. Five other combinations of online platforms were not included in the Figure.4.3 since it would be cumbersome to visualize.

4.1 Effectiveness of Online Classes in Meeting Learning Objectives

The questionnaire had 16 attributes, meant to assess the effectiveness of online classes in meeting the learning objectives of theory, practical as well as clinical training. Figure 4.4 shows the distribution of responses across the five points of the scale, in each of the 16 attributes of effectiveness. In order to compare the opinions, the neutral responses were ignored. The two agreement responses (strongly agree & agree) were added, and the two disagreement responses (strongly agree & agree) were

added, and the added responses were compared to infer the dominant opinion in each attribute. If the added percentages were different by less than 10 percentage, the responses were considered to be equivocal. Otherwise, one response was treated as dominant over the other.

There were seven attributes wherein more number of participants agreed than disagreed, there were five attributes where the disagreement was more prevalent than agreement, and there were four attributes where prevalence of agreement and disagreement were comparable. Most of the participants agreed that online classes are as effective as offline classes in terms of cost efficiency (42%), students' convenience (39%), teachers' convenience (50%), audibility of the teacher (50%), coverage of syllabus in-time (58%), in getting doubts clarified (48%) and to understand theoretical concepts (39%). On the contrary, the majority disagreed that the online classes were as effective as offline classes in terms of getting individual attention from the teacher (38%), in the practical demonstration of therapeutic maneuvers (56%), in the practical demonstration of various assessment techniques (57%), to engage in healthy classroom discussions (44%) and to create interest in the topics (38%).

4.2 Perception about the Barriers for Online Classes

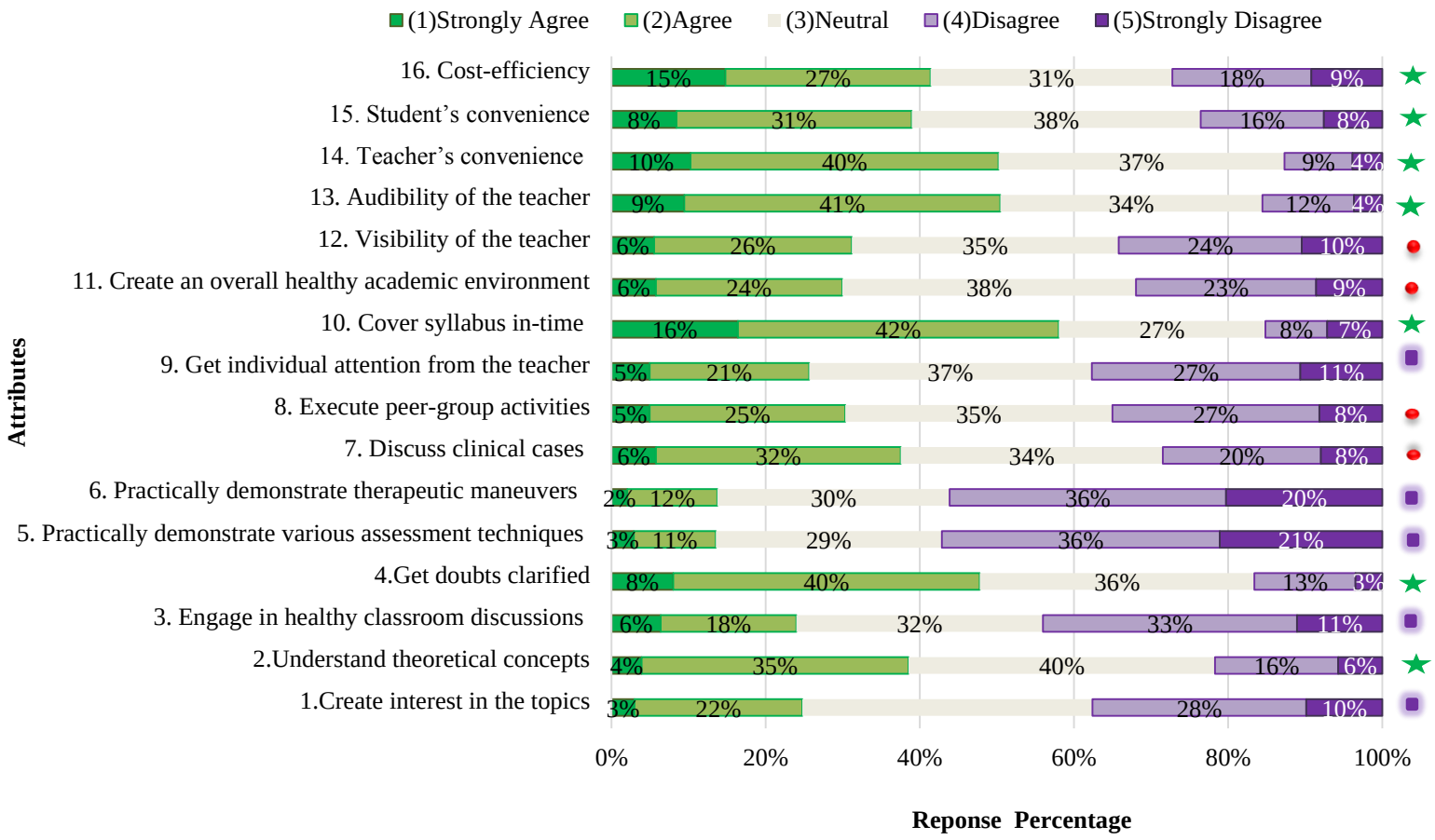
The questionnaire used ten statements to probe participants' perception of barriers for online learning, and six statements concerning the health and psychological issues in online learning. Figure 4.5 shows the percentage of responses against each point of the scale, for various probable barriers. Here again, to infer the dominant perception, the neutral responses were ignored. Eight of the 10 attributes were perceived as barriers for online classes by most participants. The majority of participants perceived: lack of conducive environment at home/hostel to attend classes (62%); poor sync of audio and video (54%); poor clarity of audio (61%); poor internet

connectivity (81%); electrical power disruption (72%); lack of internet package (70%) as the major barriers for the smooth conduct of online classes. For two of the barriers (teachers' lack of experience in conducting online classes and non-availability of smartphones/computers) the responses were equivocal.

4.3 Effect of Online Classes on Health and Psychological attributes

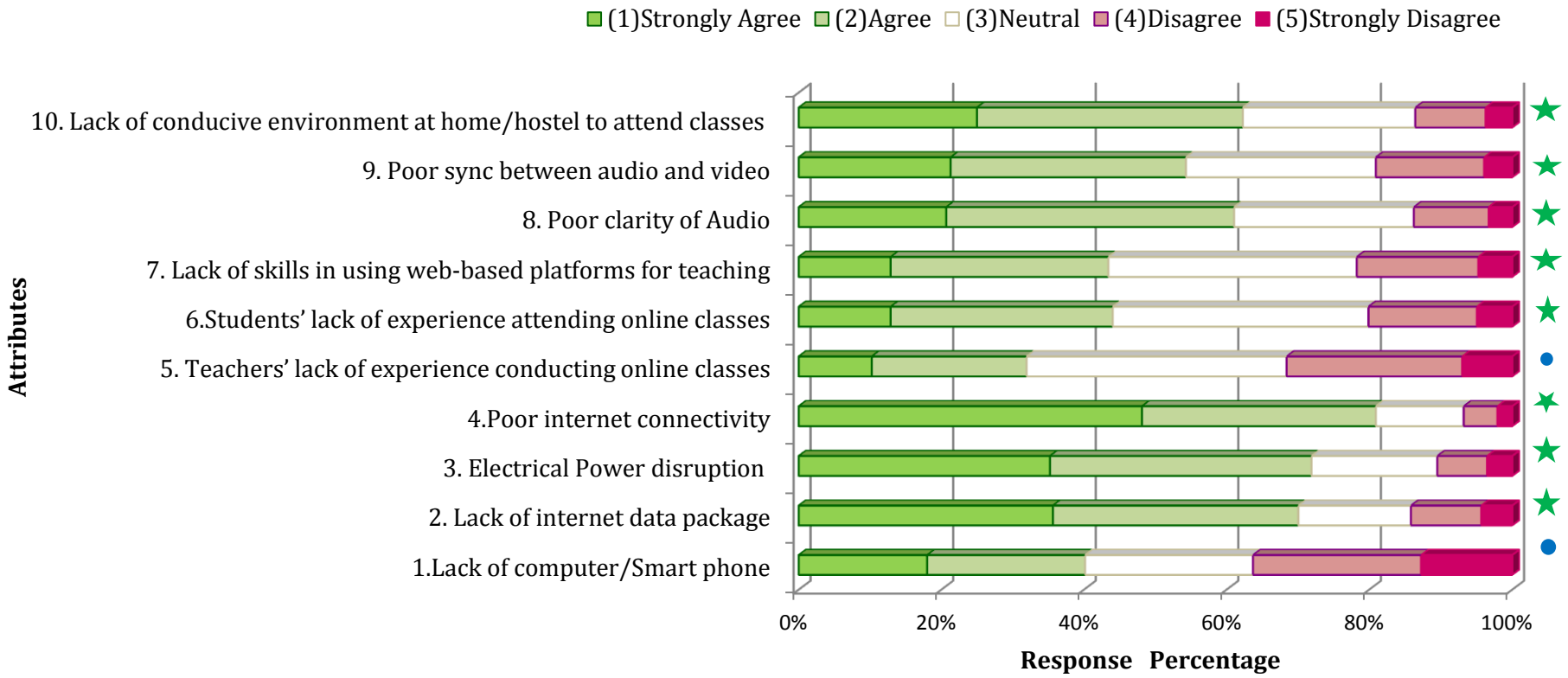
Figure 4.6 represents participants' response percentage for various health and psychological attributes probed in the questionnaire. Participants were found to have responded in equivalent percentages across five-point scale for five out of six attributes under the health and psychological domain. The results revealed that 39% of participants agreed to have an equivalent amount of induced-stress in online classes compared to that in offline classes.

Figure 4.4: *Participants' responses to attributes tapping the effectiveness of online classes in meeting learning needs*



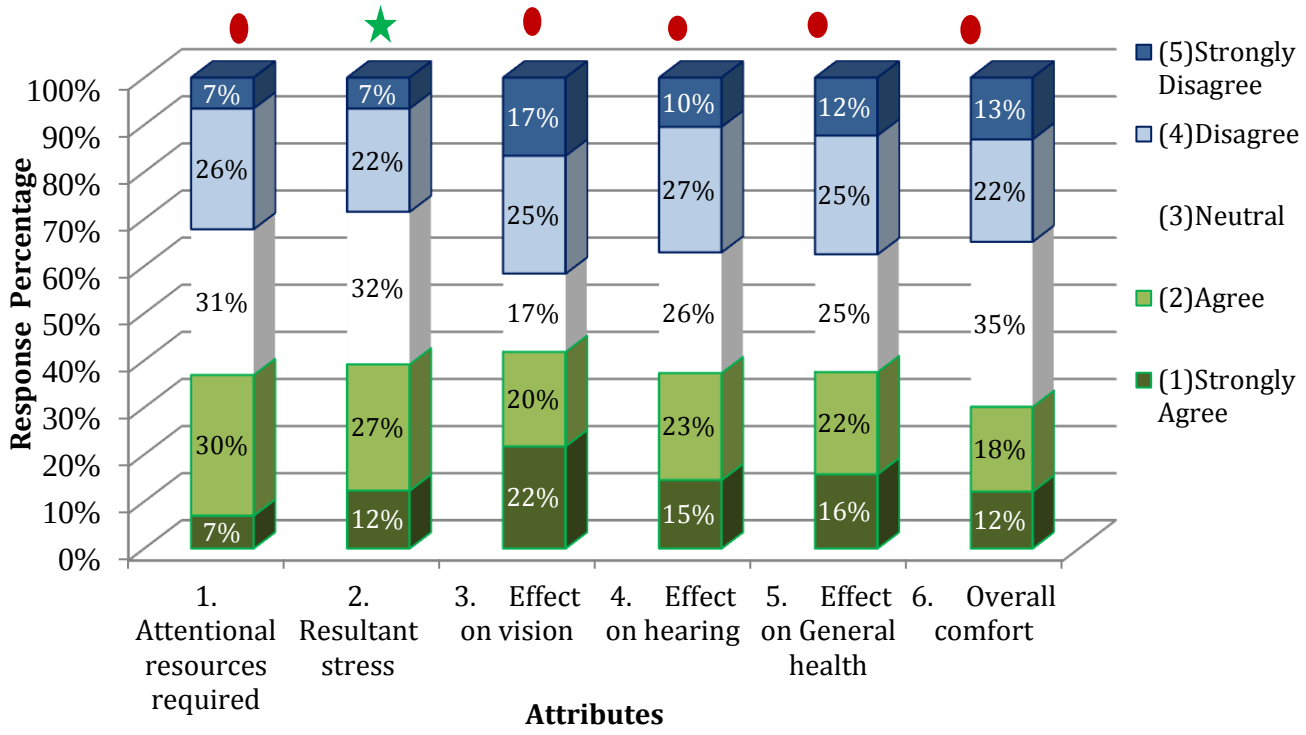
Note. Symbols represent: ★More percentage agreed, ● Mixed responses ■ More percentage disagreed.

Figure 4.5: *Participants' responses reflecting their perception of barriers to attend online classes*



Note. Symbols represent: ★ More percentage agreed, ● Mixed responses.

Figure 4.6: *Participants' responses reflecting the influence of online classes on various health and psychological attributes when compared with offline classes*



Note. Symbols represent: ★More percentage agreed, ● Mixed responses.

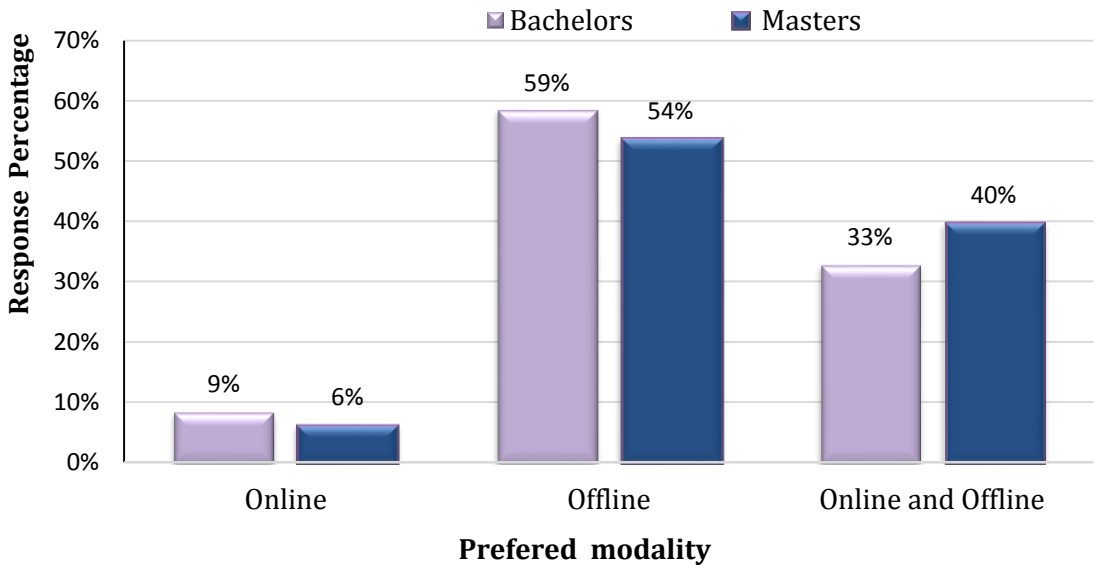
4.4 Comparison between Bachelors and Masters students

The study compared 282 bachelors and 206 masters' students for their perception about online classes. The two groups were compared for their scores in the three domains of the questionnaire: effectiveness, perception of barriers and, effect on health and psychological attributes. Table 4.1 gives the median and interquartile range of the scores of the two groups for the three domains. The Mann-Whitney U test showed that there was no significant difference ($p>0.05$) between the two groups in any of the three domains.

Table 4.1: *Median and interquartile range of the scores obtained by bachelors and masters' student groups in the three domains of the questionnaire*

Sl.No	Domain	Group	Median	Interquartile range	*Mann-Whitney U*	*p*
1	Effectiveness	Bachelors	48.50	14	-1.072	0.284
		Masters	48.00	13		
2	Barriers	Bachelors	05.75	10	-1.452	0.147
		Masters	05.35	9		
3	Health and Psychological	Bachelors	18.00	9	1.008	0.314
		Masters	18.00	9		

Figure 4.7: *Comparison between bachelors and masters based on their preferred modality in percentage*



The relationship between participant group (Bachelors/Masters) and their preferred modality for attending classes was derived. Results (Figure 4.7) suggested the preferences were comparable. Irrespective of the class, the preference of the majority (276 participants) was only-offline modality, followed by online+offline

(175 participants) and only-online modality classes (37 participants).

Reliability estimates of the rating responses by participants for all 32 attributes were obtained using Cronbach's Alpha value. They demonstrated high internal consistency across all three domains: effectiveness (α = 0.917); barriers (α = 0.884); and health and psychological (α = 0.863).

4.5 Summary of the open-ended Answers

The questionnaire used three questions to inquire the participants on their preferred modality to attend classes and their reason for their preference. Also, to determine the participants' preferred number of hours of online classes and recommended changes in the academic interest.

The preferred number of hours by bachelors participants ranged from two to twelve hours/day (Average = 4 hours/day), whereas, the masters students preferred two to nine hours/day (Average = 3 hours /day).

The open text answers were obtained and analyzed for common themes and frequency of occurrence of those themes. The reasons for preference were grouped into three themes: (1) Academic learning, (2) Teacher and peer group interaction, and (3) Health. The answers to open-ended questions were used to draw conclusions.

Chapter 5

DISCUSSION

The study aimed to assess the perceived effectiveness of online classes in Speech and Hearing programs, determine the barriers, and assess the effect on health. The difference between bachelor and master's students for their perception of the effectiveness of online classes was also investigated. The results revealed few of the attributes to be crucial in influencing the effectiveness of online classes. The findings of the study are discussed in this chapter.

5.1 Effectiveness of Online Classes in Meeting Learning Objectives

Most of the participants agreed that online classes are as effective as offline classes in terms of cost efficiency, students' convenience, teachers' convenience, audibility of the teacher, coverage of syllabus in time, and understanding theoretical concepts (Figure 4.4). The possible reason for the agreement by the majority of the participants can be having adequate technical skills and access to gadgets which aids in carrying out uninterrupted smooth conduct of online classes. This finding also suggests that the speech and hearing institutions were quick to adapt to a new format of teachings through virtual mode, justifying the attributes: cover syllabus in time, audibility of the teacher, understanding theoretical concepts. The study findings were in consensus with Stefanie et al. (2016), where authors appreciated the online format's advantages, like pace control, schedule, and flexibility of learning from archived materials.

Majority of the participants in the study agreed that they could get the doubts clarified in online classes as good as in regular classes. This can be explained by adequate interpersonal interaction maintained between the teachers and students.

Elshami et al. (2021) found similar results where online classes offer flexible pedagogy by adjusting the curriculum, assessment, and communicating effectively with students.

Results on attributes- Students' and teachers' convenience for online classes indicated that the teachers and students are in the process of constructively adapting to virtual mode. Similar findings were revealed by Verma et al. (2020), where students reported online classes as safe, comfortable and enjoyable. On the other hand, teachers reported of having an increased workload and that preparing teaching and assessment materials for the online classes consumed more time (Elshami et al., 2021). The majority of the participants agreed that the online mode of classes turns out to be cost–effective, which is expected. The reason for this finding is that E-learning cuts down costs on the infrastructure, travelling for non-residential students, hostel facilities for residential students, expenditure on co-curricular activities and miscellaneous.

A large number of participants were found to disagree on attributes addressing practical aspects of learning: Practical demonstration of various assessment techniques and therapeutic maneuvers. These attributes are crucial for healthcare professionals in online learning. This clearly suggests that the limitation of online classes is the lack of hands-on training on clinical skills. Shahrvini et al. (2021) enlisted negatives: digital fatigue causing decreased ability to participate, lack of clinical skills, laboratory, and limited hands-on learning, which are in support of the current finding.

The findings showed that the students were restricted in engaging in healthy classroom discussions in the online classes. The results suggest that classes were less

interactive and that the participants are passive learners in a virtual classroom environment. The online classes failed to create interest in the topics for most of the participants due to limited awareness of self-learning strategies. This emphasizes students to take responsibility and adopt an attitude of self-directed learning which helps in overcoming poor motivation, enthusiasm, and disinterest while learning through virtual platforms. In contrast to the findings of the current study, Vintere et al. (2021) concluded that almost one-fourth of the respondents preferred studies based on the principles of self-directed learning. A supporting study by Mailizar et al. (2020) reported similar results, revealing the importance of students' attitude.

Thakur (2018) found students are more interactive with teachers in E-learning than in face-to-face lectures. Studies found that the most significant obstacle for instructors was connecting with their students and creating a constructive learning environment to engage them (Alvarez, 2020; Duncan & Young, 2009). The current study found that participants failed to arrive at a consensus regarding attributes like carrying out clinical discussions, executing peer group activities, visibility of the teachers, and creating an overall healthy academic environment regarding the online classes conducted. One of the possible reasons could be the varied satisfaction levels perceived among participants on these attributes. Other possible reasons for an attribute like 'executing peer-group activities' could be that few participants find direct peer interaction satisfactory, unlike few other participants who seek virtual mode of interaction. Participants' personalities could also play a role wherein few introverted participants perceive home environment more academically healthy to attend online classes. This also justifies an equivalent percentage of responses under the attribute, 'visibility of the teacher'.

5.2 Perception about the Barriers for Online Classes

The primary means to connect the students and teachers virtually is through Information Communication Technologies (ICTs). One of the objectives of the current study was to explore the barriers in attending online classes. And findings indicated that eight out of ten attributes being major barriers -were in agreement with the majority of the participants (Figure 4.5).

Attributes concerning digital interfaces such as disruption of 'electrical power', 'poor internet connectivity', 'lack of internet data package', 'poor audio-video sync', and 'poor audio clarity' were reported as the primary constraints in successfully attending online classes. These preliminary attributes indicate that despite having good technical skills and handling digital tools with ease, participants lacked adequate internet facilities since they resided at their hometown in remote locations. A supporting study by Jawaid and Ashraf (2012) reported that students had mixed opinions about the requirement of their computer skills for e-Learning modules. The importance of ICTs was reported in recent studies, highlighting technical accessibility being a major barrier in E-learning (Kayaduman & Demirel, 2019; Bhaumik & Priyadarshini, 2020). These obstacles can be overcome with a collaborative strategy involving all stakeholders, intuitional support, the utilization of free internet training resources, and outside-the-box thinking (Farooq et al., 2020).

As supported by many studies, the finding also revealed that participants' lack a conducive environment at home/ hostel to attend classes'. The probable reason could be that the participants are likely to prioritize personal demands in the domestic environment and, more importantly, the distraction caused by the surroundings while attending classes. Similar findings were reported by many authors (Erwin et al., 2020; Kapasia et al., 2020; Kumar et al., 2021), such as unstable internet connectivity,

insufficient learning resources, power failures, ambivalent learning contents, overloaded lesson activities, limited teacher scaffolds, poor peer communication, conflict with home responsibilities, poor learning environment.

Additionally, lack of students experience in attending online classes and skills in using web-based platforms for teaching is agreed to be the barriers for the participants of the current study. Therefore, acknowledging the fact that participants were naïve to the modality and abrupt change in their pedagogical paradigm made it challenging to accept and adapt.

Further, participants expressed unequivocal opinions on two attributes like 'teachers' lack of experience in attending online classes' and the 'non-availability of computer/smartphone'. The results represent the uncertainty among the participants to judge teachers on their skills in online teachings. In addition, teachers' readiness for online teaching and learning is primarily determined by their computer literacy skills and ability to effectively use ICTs in the educational process (Zounek & Sudicky, 2012; Agung, 2020; Pustika, 2020). The non-availability of smartphone/computer is contrasting to the belief of the researcher and, in general, since a smartphone is typically accessed across socio-economic constraints if not limited to computers. Similar results were reported by Biswas and Debanth (2020) that e-learning divides students into privileged and unprivileged groups based on the accessibility of technical gadgets.

5.3 Effect of Online Classes on Health and Psychological Attributes

The findings under the health and psychological domain demonstrated equivalent response percentages in five of the six attributes (Figure 4.6). Although a five-point scale was used to rate the response, the results were equivocal for attributes such as attentional resources required, effect on vision, effect on hearing, effect on

general health, and overall comfort. Supporting studies revealed that engaging in long hours of screen time increases health problems such as headache, eye strain, fatigue, neck pain, back pain, sleep disturbance, loss of concentration and anxiety among students (Srivastava, 2020; Singh et al., 2021).

The participants agreed to have an equivalent amount of induced stress in online classes compared to offline classes. The finding could be attributed to the anxiety experienced by the participants in their surroundings and at a personal level. In addition, participants face pressure to sustain academic competence when there is no perceived satisfactory learning. Contrary evidence by Verma et al. (2020) reported reduced stress among students about COVID who were engaged in online learning.

Out of the three domains, the health and psychological domain demonstrated differences in responses were not significant across participants. The minor differences within each attribute were considered. As it revealed a similar proportion of response percentage varying with a marginal range. As a result, the practical implications of this finding reveals that attributes of effectiveness on learning and barriers were more influencing online classes with dominant response percentage specific to few attributes. But results of health and psychological domain is found to have no clear direction.

5.4 Comparison between Bachelors and Masters Students

On comparison, the results of the two sub cohorts (Bachelors and Masters) showed no difference across three domains: effectiveness, barriers, and health and psychological. The learning objectives in bachelors is at the basic level, while the master's program demands subject-specific in-depth knowledge. Both bachelors and master's students who took part in the study perceived online learning to be equally effective. The results can be interpreted that the bachelors and masters students are

able to meet their academic requirements and adapt to online classes as the program demands. Also it can be inferred that both groups faced similar barriers, and health and psychological concerns during the e-learning experience.

Furthermore, the relationship between the participant group (Bachelors/Masters) and their preferred modality for attending classes was derived, which followed a similar pattern of response. Irrespective of the class, the preference of the majority was only-offline modality, followed by online+offline and only-online modality classes. This could be attributed to the demerits of online learning such as digital fatigue causing decreased ability to participate, lack of clinical skills, laboratory, and limited hands-on learning. Speech pathology and Audiology being clinical fields, demand extensive lab training and clinical training. Lack of these in the online mode appears to have concerned the participants, and that could be the primary reason for their preference.

On the contrary, online modality helps in establishing new methods of learning by completely utilizing the technological advances in aiding better quality of education. Convenience, instructor availability, and online interactions were cited as positives for the online course (Mansour et al., 2007; Zhang et al., 2020; Dutta, 2020; Khan, 2020). Nguyen (2015) claimed that students learn through virtual mode the same way they can in a classroom setting, irrespective of the technology being high-tech or low-tech. Supporting studies reveal similar findings (Satish et al., 2020; Zhang et al., 2020). Therefore, blended learning appears to be the solution in the field of Speech pathology and Audioloy. Blended learning is a newer pedagogical model, which is still under experimentation across educational programs. Supporting study by Mansour et al. (2019) used a novel hybrid pedagogical model with the learning material, their instructors, and among peers. This model improved academic

performance in both summative and formative assessments. Means et al. (2010), Liu et al. (2016), and Drago et al. (2017) also support blended learning being the efficient mode of teaching in health professions.

The participants putforth their views on their preferred modality to attend classes are summarized in Table 5.1. Furthermore, the participants also recommended changes in the academic interest regarding online classes. To mention few, (1) to increase the time interval between the online classes, (2) to shorten the duration of each class, (3) to use more interactive tools while teaching, (4) use of various resources and websites for teaching concepts with clarity and engage student's interest, (5) to switch on the video-for virtual face-to-face interaction, (6) conduct short quizzes as immediate feedback of the classes and (7) to use standard software/platform to conduct internal assessment.

Table 5.1: *Summary Table for the probable reasons for preferred modality*

Theme	Online modality	Offline modality	Online and Offline (Combination of both)
I. Academic Learning	• Easier accessibility to notes • Convenient • Delay in syllabus coverage • Appropriate for an emergency crisis • Presentation skills improved for online than offline • Fails to instill interest in the topic / subject.	• Better clarity of the concepts • Effective practical learning • Gain clinical knowledge and exposure • Effective interaction with the teachers and students • More reliable assessments /tests • Intellectually stimulating environment • No Network issues • Holds attention and concentration	• Online for theoretical & Offline for practical lessons • Online for presentation and Offline for Discussion • Online for webinars (international guest lecturers) Offline for faculty's inability for physical presence. • Online- Class recordings Offline-Hands on training. • Conduct classes utilizing online –offline advantages • Concepts are better grasped when introduced at first offline, later following classes to be

			held online.
II. Teacher and Peer-group interaction	• Easy mode to share study materials • Lack enthusiastic participation in virtual class • Effective interactions with teachers • Lack feedback in learning concepts without physical presence of the teacher	• Improve the pragmatic skills • Easier to get doubts clarified • Immediate discussion with peers, post lecture helps in better comprehension of the concepts	
II. Health	• Increased stress • Increased screen time- pain/ burning in eyes • Cause headache • Anxiety caused due to social isolation • More time to focus on well-being	• Happier environment • Reduced stress • Opportunities for co-curricular activities • Less strain on eyesight • Effortful listening, demands relatively more	

	• Ensures safety by avoidance of physical contact • Better flexibility and provides time for critical learning • Miss-out on having friends, associated with positive attitude towards learning • Demands intense self –discipline • Cost-effective • Incompatible to health care professionals to learn.	concentration. • Time-efficient

Chapter 6

SUMMARY AND CONCLUSIONS

Emergency Remote Teachings (ERT) has become the new age in the education sector due to the recent pandemic. Online learning approaches were quickly regulated in this regard to resume teachings and learnings across academic disciplines. Since ERT is a novel approach, it was essential to understand the efficacy and the influencing factors of online learning. The aim of the study was to assess the effectiveness of online classes in training prospective speech language pathologists and audiologists.

The participants of the study were students pursuing bachelor's and master's degree programs in speech and hearing. An online survey was conducted utilizing a questionnaire, formatted in Google Forms. The questionnaire included three domains: the effectiveness of online modality in meeting learning needs, the barriers encountered, and the effects on health and psychological attributes. The responses of the participants were measured using a five-point Likert rating scale. The response data were collected using Microsoft Excel sheets and results were derived following descriptive statistics.

The results revealed that participants faced difficulty with accessing internet and seamless network. Practical aspects of learning like, clinical training and hands-on learning were strained through online mode. Participants responded in equivalent percentage on attributes concerning health and psychological, where majority of the participants reported equivalent amount of Induced- stress in online classes compared to that in offline classes. On comparing the two groups, (Bachelors /Masters) no differences were derived. The results indicated that offline modality in the most preferred modality to attend classes.

Based on the study findings, it can be implied online learning could aid in the development of new pedagogical models in educational policy for the successful and efficient conduct of classes. Thus, it has led the educational community, including students, teachers, and decision-makers, to be more open-minded and less reliant on rigid educational approaches. This creates the path for new teaching approaches to be adopted and explored, which may be as effective as or more effective than traditional teaching methods. After assessing the benefits and drawbacks of online learning, blended learning-(combination of online and offline) may be a viable option in the post-pandemic period. Meanwhile, e-learning has equipped students to tackle future unanticipated circumstances, ensuring that the education is not jeopardized.

The findings are based on the perceived effectiveness of the online classes and not an objective measure of assessment on efficacy. Further, the results of the study is not to be compared with distance education learning. The limitations of the study is the use of non-standardized questionnaire in the study. Future studies can probe into the efficacy of online classes in the teachers' perspective in a manner similar to the current study.

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APPENDIX