

THE VOCAL QUALITY OF DEAF CHILDREN

A Research Paper

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CHAPTER I
INTRODUCTION

"Tense", "flat", "breathy", "harsh", and "throaty" are some of the adjectives that Calvert (1966) derived from a questionnaire given to teachers of the deaf, that described voices of the deaf. Although there was no agreement on one descriptive adjective, there was total agreement that the deaf voice is unpleasant. Silverman states that with a hearing loss of 45 dB or more there is voice deviation (Calvert, 1962). The definition for voice includes every factor that distinguishes one's individual speech from that of another. This broad definition deals with timing and rhythm, pitch and intonation, velar control, articulation and loudness. All of these characteristics contribute to voice.

Much has been written on the characteristics that contribute to the make-up of the voice. However, little or no research has been conducted to test the relationship between the vocal quality of the deaf child and the : 1) age of onset of the loss; 2) severity of the loss; and 3) etiology of the loss. This paper will examine and discuss the many distinctive attributes of the deaf voice and determine if there is a direct relationship between the above three factors and if these factors will produce a specific voice when these factors are identical.

It is the belief of the author that there are more determining

factors which produce a definite voice quality in the deaf other than the age of onset, severity of the loss, and the etiology. In the author's opinion, the voice quality of the deaf child does depend to a small degree on the above three factors, but more importantly the quality is dependent on the individual.

The term deaf is used loosely to refer to any amount of hearing loss, so it is necessary to make a distinction between the deaf and the hard of hearing. In 1937 the Committee on Nomenclature of the Conference of Executives of American Schools for the Deaf proposed the following definitions which are still valid:

1. The Deaf: Those in whom the sense of hearing is non-functional for the ordinary purposes of life. This general group is made up of two distinct classes based entirely on the time of the loss of hearing:
 - a. The congenitally deaf: Those who were born deaf.
 - b. The adventitiously deaf: Those who were born with normal hearing but in whom the sense of hearing became nonfunctional later through illness or accident.
2. The Hard of Hearing: Those in whom the sense of hearing, although defective, is functional with or without a hearing aid.

Although it is not possible to draw firm boundaries between the deaf and the hard of hearing on the basis of the extent of loss shown on an audiogram, the following classification, based on pure-tone hearing levels through the speech frequencies, is a general guide to the degree of severity of hearing losses:

30-50 dB	Mild
50-70 dB	Moderate
70-85 dB	Severe
85-110 dB	Profound (Katz, 1972)

CHAPTER II

REVIEW OF THE LITERATURE

This chapter will present the speech characteristics of deaf persons. Through studies it has been shown that the speech of individuals with a profound hearing loss that dates before birth or shortly thereafter differs from the speech of people with normal hearing. Presented here are the main differences.

Poor timing is considered to be one of the major causes of poor intelligibility of speech of the deaf. They normally speak at a much slower rate than do hearing persons (Boone, 1966). The reason their rate is slower, other than the fact that they often pause longer between words, is because they prolong their vowels, often changing them into elaborate diphthongs with upward or downward inflectional sweeps (Boone, 1966). Deaf speakers fail to make the difference between the durations of stressed and unstressed syllables sufficiently large (Angelocci, 1962). They prolong the durations of both stressed and unstressed syllables with a greater prolongation on unstressed syllables. This appears to make all of the syllables stressed. It is believed that this is the result from articulation drills with individual speech sounds.

The rhythmic features are achieved by appropriate coarticulation and by controlled variations of loudness, pitch, and duration especially of the vowel components of syllables (Calvert and Silverman, 1975). Even if the speaker has achieved correct loudness, pitch, and dura-

tion he may not use them appropriately so that his message is understood.

The fundamental frequency, often called the pitch of voiced speech sounds, varies considerably in the speech of a speaker. The difficulties that the deaf speaker has with pitch are of two types: inappropriate average pitch and improper intonation (Nickerson, 1975). Intonation is divided into the monotone voice and extreme pitch variance. Both young male and female deaf speakers tend to speak with a higher fundamental frequency than hearing persons or speak in a falsetto voice (Calvert and Silverman, 1975 and Angelocci, Kopp, and Holbrook, 1964).

The deaf have little variation in their pitch, which is why their speech is labeled monotone (Calvert, 1962). A particular problem is that of inappropriate or insufficient pitch change at the end of a sentence (Nickerson, 1975). The lack of control that the deaf have over fundamental frequency causes wide and random fluctuations. A deviant pitch is a result of the use of inappropriate muscles when articulating. This condition is often associated with high arched vowels. The upward movements of the tongue raises the larynx and may over tense the vocal folds (Calvert and Silverman, 1975).

Pitch is one of the hardest areas of speech for the deaf to control. Pitch is normally described in the terms of high and low which is rather abstract for the deaf since they have never heard the difference between high and low. They do know what loud and soft means which may explain why they often increase their volume when raising their pitch.

Nasality has been described as a quality problem because improper velar control can give the speech a characteristic sound. The velum ^{no!} is an opening between the oral and nasal cavities. When it is lowered, it opens the passage to the nasal pharynx for nasal consonants. When it is raised, it seals off the passage for non-nasal sounds. If the velum is raised when it should be lowered the speech is hyponasal; if it is lowered when it should be raised hypernasality is the result. Poor velum control can also lead to articulatory problems. Many times a deaf speaker will raise the velum when it should be lowered and lower it when it should be raised which causes substitutions of nasal for non-nasal sounds and vice versa. It is very difficult to learn velar control because one can not see it move or feel it. Improper velar control is not the only factor influencing nasality. Malarticulation, pitch variation, and speech tempo may also be involved (Colton and Cooker, 1968).

In a cinefluorographic study of hypernasality comparing five deaf speakers producing oral syllables (not necessarily hypernasal) it was found that the experimental deaf group all exhibited velopharyngeal opening, which was not true of the normally speaking control group (Calvert and Silverman, 1975). It was found that deaf speakers usually have shorter and thinner velums, which may result from the lack of muscle activity involved in velopharyngeal closure.

The deaf child has natural spontaneous vocalizations with a greater amount of vowel sound than of consonants (Greene, 1964). They seem to produce a larger amount of front vowels and front consonant sounds as opposed to back vowel and consonants (Carr, 1953). The differences

of speech sounds between the deaf and hearing children become more apparent as they get older. This suggests that spontaneous development of sounds by deaf children does not continue much beyond one year. Carr also says that the greater amount of front consonants among deaf children may be due to the greater visibility, and, hence, inevitability of the articulatory gestures involved.

The vowels of the English language require alternating closure of the glottis by contact of the vocal folds without an unnecessary leakage of air. The improper control of this leads to a distracting voice quality which actually degrades intelligibility. The closure of the folds may be either incomplete, too brief, or both. The condition may be reflected mainly in abnormally short phrased speech that is separated by unnecessarily frequent inhalations. The excessive force on plosives preceding a vowel may give it a breathy quality.

The normal talker uses the muscles for articulation and voicing synergistically. These muscles work together without undue tension. Perhaps because he gropes for feedback or because he has been taught with overemphasis on the tactile impression gained from feeling a teacher's larynx, the deaf talker may speak with a great deal of generalized constrictions and tension in both the glottal and supra-glottal areas. The result is commonly termed stridency or harshness.

Normal talkers regulate loudness to accommodate to distance from a listener, to requirements of a social situation and to varying levels of ambient noise. Deaf talkers may be unaware of these

conditions or may simply not be able to speak loud enough in any situation. Inefficient use of the air stream at the glottis may be responsible for the inability to speak loud enough. Although the different problems in the voice of the deaf have been separated; it is important to know that these problems are not independent and that they interrelate in many ways.

Calvert (1962) makes the point that the types of durational distortions that impair the intelligibility of the speech of the deaf (extension of unstressed vowels, fricatives and closure periods of plosive consonants) may also contribute to perceived speech quality. He notes that deaf speakers are more easily distinguished from speakers with normal hearing as the articulatory complexity of the utterance increases, and he concludes that distortions in phoneme durations may be significant determinants of what is commonly called "deaf voice." Hudgins (1934, 1936, 1937, 1946) has extensively documented the interrelationship between the problem of inappropriate control of breathing during speech and that of poor timing and rhythm.

Furthermore, the inappropriate laryngeal posture that seems to be a concomitant of breathy voice quality undoubtedly has an influence on the control of laryngeal muscles that produce changes in pitch and the distinction between voiced and voiceless consonants. Colton and Cooker (1968) have suggested that the perception of nasality may be influenced by such factors as articulatory errors, pitch variations, and slower-than-normal tempo. The deaf child has difficulty gaining separate control over volume and pitch. Often he tends to increase vocal effort when trying to increase pitch. That pitch, volume, and

CHAPTER III

PROCEDURE

There were twenty-three subjects selected for this study; thirteen males and ten females. All were between the ages of 7-8 and 13-3. Three of the subjects had a moderate hearing loss, nine a severe loss and eleven a profound loss. Eighteen of the subjects were congenitally deaf, three adventitiously deaf and one was of undetermined etiology. All subjects were of normal intelligence.

Each subject's pure-tone hearing was tested by a Naico-MA24 audiometer in an acoustically appropriate recording studio, to determine the severity of the loss. A portable Bigston tape recorder was used to tape a voice sample. The following passage was read by the subjects for the voice sample:

Last Thursday and Friday we went to camp. I slept in a tent. We made a big campfire. We saw an Indian. We had a lot of fun.

The quality of each subject's voice was evaluated by ten teachers of the deaf. An evaluation scale was designed by the author for the teachers to use. The evaluation rated quality overall on a one to five scale. One was rated as poor quality, two below average, three average, four good and five excellent quality. The intelligibility was rated pass(+) or fail (-). The most outstanding aspect of the voice was noted on the evaluation.

timing are intimately interdependent as determiners of stress patterns is well known, but exactly how they relate is not.

CHAPTER IV

RESULTS

The results of the hearing test are in Table 1. Included are the subject's name, age, whether the loss was moderate, severe or profound and whether the loss was congenital or adventitious. In the case of an adventitious loss the etiology and the age of onset was noted.

Table 1

Subjects	Age	Severity of Loss	Etiology
Brian H.	9-8	Moderate	Congenital
Vince B.	10-5	Moderate	Congenital
Mike M.	12-2	Moderate	Congenital
Ronnie S.	7-8	Severe	Congenital
Ricky B.	8-3	Severe	Congenital
Kim J.	7-8	Severe	Congenital
Hank J.	11-10	Severe	Congenital
Cheryl B.	12-8	Severe	Congenital
Doni S.	13-0	Severe	Undetermined
Ranae B.	12-7	Severe	Congenital
Sheila H.	12-7	Severe	Congenital
Billy K.	12-9	Severe	Congenital
Keith C.	9-11	Profound	Congenital
Beth J.	8-4	Profound	Congenital
Wendy O.	10-8	Profound	Congenital
Rusty G.	11-8	Profound	Congenital
Todd G.	12-6	Profound	Congenital
Phillip D.	12-10	Profound	Congenital
Lynn T.	12-8	Profound	Congenital
Dyuina H.	13-3	Profound	Congenital
Susan K.	12-10	Profound	Antibiotics after premature birth
Keith M.	10-9	Profound	Spinal Meningitis at 2½ years
Butch R.	11-0	Profound	Spinal Meningitis at 2 years

Initials should be preferable

The publication of the teacher's evaluation of the voice quality of the subject's may prove helpful to other workers in the field. Therefore, the evaluations are in Tables 2 to 11. (See the appendix.)

Some of the comments from the teachers about the voice quality were quite interesting and surprising. All of the teachers were astounded as to how unintelligible the speech was. They had always thought the subjects were more intelligible because they had been looking at them when they were talking. Consequently the intelligibility decreases when one is not looking at the subject.

Of the three subjects that were congenitally deaf with a moderate loss, two received identical scores. Five evaluators considered their vocal quality poor, four considered them to be below average and one considered them average. All ten evaluators considered them to be unintelligible and reported the subjects to be nasal, breathy, high pitched and using improper rhythm patterns. The third subject scored average and good on overall quality. He was thought to be intelligible although somewhat nasal and using improper rhythm.

Of the nine subjects with severe congenital hearing loss the evaluators considered most to have either poor or below average quality. Of the eight with a profound congenital loss it was thought that most had poor quality. Although there is a difference between severe and profound hearing loss each group had representatives that were nasal, breathy, and used improper pitch, rhythm and volume. Each subject in all groups used poor articulation.

The three subjects with a profound adventitious hearing loss were

→ given by most a below average quality rating. From these results it is shown that the subjects with a profound congenital loss have a poorer vocal quality than those that are adventitious. The specific qualities of breathiness, improper use of rhythm, nasality and an inappropriate pitch and volume are also seen in this group.

The results of this study tend to confirm the stated hypothesis even though this study involved a minimal amount of subjects that were adventitiously deaf. It is felt by the author that vocal quality in general relates to the: 1) age of onset of the loss; 2) severity of the loss; and 3) etiology of the loss.

Further research of vocal quality and its relationship to the above three factors might include a larger number of subjects that are adventitiously deaf.

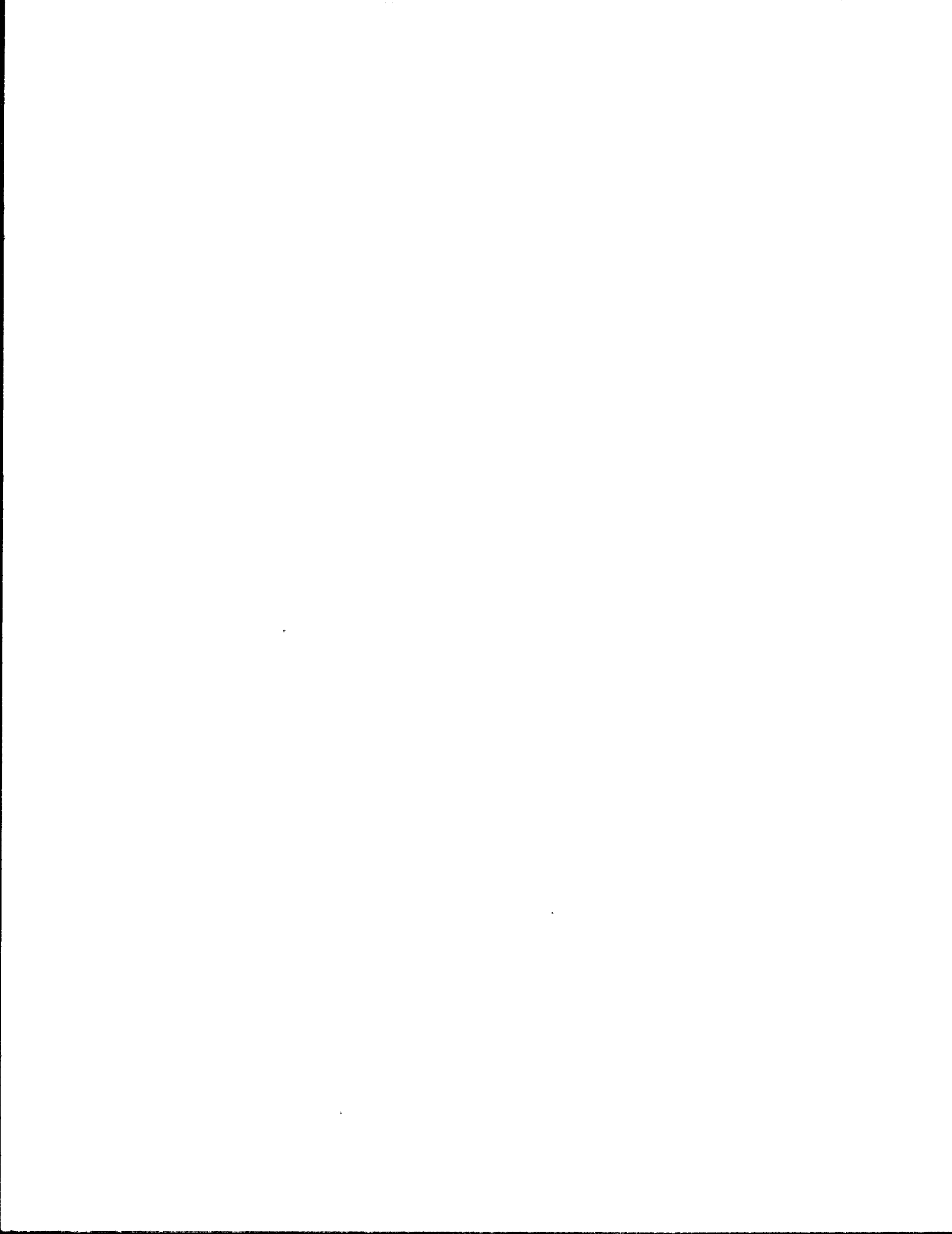
CHAPTER V

CONCLUSION

This study concerned the voice quality of deaf children and its relationship to: 1) the age of onset of the loss; 2) the severity of the loss; and 3) the etiology of the loss. Twenty-three subjects from the ages of 7-8 to 13-3 were given a hearing test and were tape recorded while reading. Ten teachers of the deaf evaluated the vocal quality from the tape.

The overall vocal quality was evaluated on a one to five scale. One being poor quality, two below average, three average, four good and five excellent. Also, the intelligibility was rated according to pass or fail.

It was found that there is a relationship between the etiology, the severity and age of onset and the vocal quality. Of the subjects used there was a better vocal quality among those with a moderate and severe congenital hearing loss. Those with a profound adventitious hearing loss had a similar quality voice to those with a moderate or a severe congenital loss. Those with a profound adventitious hearing loss had a better voice quality than those with a profound congenital loss.



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APPENDIX

Table 2. Teacher's Evaluation - Teacher A

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	4	+	Nasal
Ronnie S.	2	-	Rhythm
Ricky B.	1	-	Rhythm
Keith C.	2	-	Rhythm
Vince B.	1	-	Pitch
Kim J.	3	-	Nasal
Beth J.	3	-	Pitch
Wendy O.	2	-	Pitch
Butch R.	2	-	Rhythm
Rusty G.	1	-	Pitch
Hank J.	2	-	Breathy
Mike H.	2	-	
Cheryl B.	3	-	
Susan K.	2	-	Nasal
Doni S.	2	-	Monotone
Ranae B.	4	+	Nasal
Sheila H.	1	-	Rhythm
Billy K.	2	-	Rhythm
Keith M.	3	-	Rhythm
Todd G.	2	-	Pitch
Phillip D.	2	-	Volume
Lynn T.	3	-	
Dyuina H.	1	-	Pitch

Table 3. Teacher's Evaluation - Teacher B

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	3	+	Nasality
Ronnie S.	2	-	Rhythm
Ricky B.	1	-	Rhythm
Keith C.	1	-	Rhythm
Vince B.	2	-	Rhythm
Kim J.	2	-	Nasality
Beth J.	1	-	Rhythm
Wendy O.	1	-	Rhythm
Dutch R.	1	-	Rhythm
Rusty G.	1	-	Rhythm
Hank J.	1	-	Breathy
Mike H.	1	-	Rhythm, pitch
Cheryl B.	2	+	Articulation
Susan K.	1	-	Nasality
Doni S.	1	-	Breathy
Ranae B.	3	+	Rhythm
Sheila H.	1	-	Nasality
Billy K.	1	-	Rhythm
Keith M.	2	-	Rhythm
Todd G.	1	-	Pitch, rhythm
Phillip D.	2	-	Breathy, rhythm
Lynn T.	2	-	Pitch, rhythm
Dyaina H.	1	-	Pitch, rhythm

Table 4. Teacher's Evaluation - Teacher C

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	5	+	Articulation
Ronnie S.	1	-	Breathy, articulation
Ricky B.	1	-	Articulation
Keith C.	1	-	Articulation
Vince B.	3	-	Articulation
Kim J.	3	-	Articulation, nasality
Beth J.	1	-	Articulation
Wendy O.	2	-	Articulation, pitch
Butch R.	3	-	Articulation, pitch
Rusty G.	1	-	Articulation
Hank J.	2	-	Articulation, breathy
Mike M.	3	-	Articulation
Cheryl B.	4	+	Rhythm
Susan K.	4	-	Articulation
Doni S.	2	-	Articulation
Ranae B.	5	+	Nasality
Sheila E.	3	-	Pitch
Billy K.	2	-	Rhythm
Keith M.	3	-	Rhythm
Todd G.	1	-	Pitch
Phillip D.	1	-	Breathy
Lynn T.	3	-	Pitch
Dyana H.	1	-	Pitch, breathy

Table 5. Teacher's Evaluation - Teacher D

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	2	+	Nasality
Ronnie S.	1	-	Rhythm, breathy
Ricky P.	2	-	Rhythm, articulation
Keith C.	2	-	Rhythm, articulation
Vince B.	2	-	Articulation, rhythm
Kim J.	2	+	Rhythm, pitch
Beth J.	2	-	Pitch, nasality
Wendy O.	1	-	Pitch, rhythm
Butch R.	1	-	Rhythm, pitch
Rusty G.	1	-	Everything
Lank J.	1	-	Breathy, pitch
Mike M.	2	+	Breathy, pitch
Cheryl B.	1	-	Pitch, articulation
Susan K.	2	-	Pitch, nasality
Doni S.	1	-	Everything
Ranae B.	2	+	Nasality, pitch
Sheila H.	1	-	Everything
Billy K.	2	-	Rhythm, pitch
Keith M.	3	+	Pitch, rhythm
Todd G.	1	-	Everything
Phillip D.	2	-	Breathy, pitch, rhythm
Lynn T.	2	-	Pitch, nasality
Dyuina H.	1	-	Everything

Table 6. Teacher's Evaluation - Teacher E

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	3	+	Rhythm
Ronnie S.	1	-	Breathy, rhythm, pitch
Ricky B.	2	-	Breathy, rhythm
Keith C.	2	-	Rhythm, monotone
Vince B.	1	-	Pitch, rhythm, nasal
Kim J.	2	-	Pitch, rhythm, nasal
Beth J.	1	-	Breathy, rhythm, nasal
Wendy O.	1	-	Breathy, rhythm, nasal
Butch R.	2	-	Breathy, rhythm, nasal
Rusty G.	1	-	Pitch, nasal, breathy
Hank J.	2	-	Breathy, rhythm, nasal
Mike M.	1	-	Breathy, rhythm, nasal
Cheryl B.	1	-	Rhythm
Susan K.	1	-	Rhythm, nasal
Doni S.	1	-	Nasal, rhythm, breathy
Ranae B.	1	+	Nasal, rhythm, pitch
Sheila H.	1	-	Nasal, pitch, rhythm
Billy K.	1	-	Rhythm, pitch
Keith M.	2	+	Monotone, rhythm, pitch
Todd G.	1	-	Nasal, rhythm, pitch
Phillip D.	1	-	Nasal, rhythm, monotone
Lynn T.	1	-	Nasal, rhythm, pitch
Dyaina H.	1	-	Breathy, nasal, pitch

Table 7. Teacher's Evaluation - Teacher F

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	3	+	Rhythm
Ronnie S.	1	-	Vol., pitch, breathy, rhythm
Ricky B.	2	-	Pitch, breathy, rhythm
Keith C.	2	-	Rhythm
Vince B.	1	-	Pitch, rhythm, nasal
Kim J.	2	-	Nasal, pitch, rhythm
Beth J.	2	-	Vol., nasal, rhythm
Wendy C.	1	-	Pitch, breathy, nasal, rhythm
Butch R.	2	-	Rhythm, breathy, nasal
Rusty G.	1	-	Breathy, pitch, nasal, rhythm
Hank J.	2	-	Breathy, rhythm, nasal
Mike M.	1	-	Rhythm, breathy, nasal
Cheryl B.	2	-	Rhythm
Susan K.	2	-	Nasal, rhythm
Doni S.	2	-	Breathy, nasal, rhythm
Ranae B.	2	+	Monotone, nasal, breathy, rhythm
Sheila H.	2	-	Nasal, rhythm
Billy K.	2	-	Breathy, pitch, rhythm, nasal
Keith M.	2	-	Monotone, rhythm, breathy
Todd G.	1	-	Pitch, breathy, nasal, rhythm
Phillip D.	1	-	Rhythm, monotone, vol., breathy, nasal
Lynn T.	1	-	Pitch, nasal, rhythm
Dyuna H.	1	-	Pitch, nasal, breathy, rhythm

Table 8. Teacher's Evaluation - Teacher G

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	4	+	Nasal, rhythm
Ronnie S.	1	-	Breathy, rhythm
Ricky B.	1	-	Articulation
Keith C.	1	-	
Vince B.	2	-	Pitch, rhythm
Kim J.	2	-	Pitch, rhythm
Beth J.	1	-	Nasal
Wendy O.	1	-	Pitch, rhythm
Butch R.	1	-	Rhythm
Rusty G.	1	-	Pitch, rhythm
Hank J.	2	-	Breathy
Nike M.	2	-	Nasal
Cheryl B.	2	-	Pitch, rhythm
Susan K.	1	-	Nasal, rhythm
Doni S.	1	-	Rhythm
Ranae D.	1	-	Rhythm
Sheila H.	1	-	Nasal, rhythm
Billy K.	1	-	Pitch, rhythm
Keith M.	3	+	Pitch, rhythm
Todd G.	1	-	Pitch
Phillip D.	2	-	Pitch, rhythm, breathy
Lynn T.	2	-	Pitch
Dyulna H.	1	-	Pitch

Table 9. Teacher's Evaluation - Teacher II

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	4	+	Nasal
Ronnie S.	1	-	Breathy
Ricky B.	1	-	Rhythm
Keith C.	1	-	Rhythm
Vince B.	1	-	Pitch, breathy
Kim J.	2	-	Nasal
Beth J.	1	-	Breathy
Wendy O.	1	-	Pitch
Butch R.	2	-	Pitch
Rusty G.	1	-	
Hank J.	2	-	Breathy
Mike M.	1	-	Breathy, rhythm
Cheryl B.	2	-	
Susan K.	1	-	Nasal
Doni S.	1	-	Breathy, rhythm
Ranae B.	3	+	
Sheila H.	1	-	Nasal , pitch
Billy K.	1	-	Rhythm
Keith M.	2	-	Monotone
Todd G.	1	-	Pitch
Phillip D.	1	-	Monotone
Lynn T.	2	-	Pitch
Dyuina H.	1	-	Pitch

Table 10. Teacher's Evaluation - Teacher I

Subjects	Quality	Intelligibility	Outstanding Qualities
Brian H.	4	+	Nasal
Ronnie S.	1	-	Breathy
Ricky B.	1	-	Rhythm
Keith C.	2	-	Pitch, rhythm
Vince B.	1	-	Pitch, breathy, rhythm
Kim J.	2	-	Nasal
Beth J.	1	-	Breathy, pitch, rhythm
Wendy O.	1	-	Pitch
Butch R.	1	-	Pitch
Rusty G.	1	-	Pitch, rhythm
Hank J.	2	-	Breathy
Mike M.	1	-	Rhythm
Cheryl B.	2	-	Rhythm, pitch
Susan K.	2	-	Nasal
Doni S.	1	-	Rhythm
Ranae B.	2	-	Nasal, breathy
Sheila H.	1	-	Nasal
Billy K.	2	-	Pitch, rhythm
Keith M.	3	+	Monotone, rhythm
Todd G.	1	-	Pitch, nasal, rhythm
Phillip D.	1	-	Monotone
Lynn T.	2	-	Pitch, rhythm, nasal
Dyuina H.	1	-	Pitch, rhythm, nasal, breathy

Table 11. Teacher's Evaluation - Teacher J

Subject	Quality	Intelligibility	Outstanding Qualities
Brian H.	4	+	Nasal
Ronnie S.	1	-	Breathy
Ricky B.	2	-	Rhythm
Keith C.	2	-	Monotone
Vince B.	2	-	Monotone, high
Kim J.	2	-	Nasal
Beth J.	1	-	Nasal
Wendy O.	1	-	Pitch
Butch R.	2	-	Rhythm
Rusty G.	1	-	Pitch
Hank J.	2	-	Breathy
Mike H.	2	-	Rhythm
Cheryl B.	2	-	Rhythm
Susan K.	1	-	Nasal
Doni S.	1	-	Rhythm
Ranae B.	1	+	Nasal
Sheila H.	1	-	Nasal
Billy K.	2	-	Pitch
Keith H.	3	-	Monotone
Todd G.	1	-	Pitch
Phillip D.	1	-	Monotone
Lynn T.	2	-	Pitch
Dyaina H.	1	-	Pitch

