EDUCATUM JSMT Vol. 9 No.2 (2022)
ISSN 2289-7070 / e-ISSN 2462-2451 (1-9)
https://ejournal.upsi.edu.my/index.php/EJSMT/index

An Analysis of Voice-Controller's Implementation in Teaching DLP Form-One Mathematics: A Case Study

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Published: 21 September 2022

To cite this article (APA): Kang, K. C. A., & Abdullah, M. F. N. L. (2022). An Analysis of Voice-Controller's Implementation in Teaching DLP Form-One Mathematics. *EDUCATUM Journal of Science, Mathematics and Technology*, *9*(2), 1-9. https://doi.org/10.37134/ejsmt.vol9.2.1.2022

To link to this article: https://doi.org/10.37134/ejsmt.vol9.2.1.2022

Abstract

This case study aims to analyze voice-controller (VC)'s implementation of five, national-type secondary schools, Kinta Utara, Ipoh, Perak, teachers in teaching mathematics form-one (T1) Dual Language Programme (DLP). VC consists of three elements: sound level and voice level practice (SL-VL-P); marker and voice level practice (M-VL-P); and activity and voice level practice (A-VL-P). Students' voice level barrier disturbs teaching and learning. Teacher should control students' voice level. This study contributes an alternative classroom control strategy for teachers and reflection to Secondary School Standard Curriculum planner about learning and facilitating's situation in school from communication perspective. Data collection methods were teaching observation, interview, and document analysis. Content analysis method was used to analyze data. The research's findings indicate the number of participants who had the VC's goal: cognitive domain (five), affective domain (four), and psychomotor domain (none). Affective domain's level is limited within receiving and giving response. In VC implementation: (i) The number of participants who implemented SL-VL-P using: routine class explanation (three), reminder (five), oral order (two), repeated conversation (two), blame (one), positive provocation (one), and questioning (two). (ii) The number of participants who implemented M-VL-P using: voice tone (three), body language (three), and teaching aids (none)(iii) The number of participants who implemented A-VL-P using: group size plan (two), activity's voice level explanation (one), oral order (two), motivation (one), and questioning (two). 'Giving reminder' is the common way for all participants. No formal VC drill for students. Two participants faced problem in implementing VC. Conclusion: Five participants' VC goals are not holistic. Five participants implemented VC undirectedly. There are students unable to perform VC. Implication: Teachers should: (i) plan holistic goals. (ii) plan formal VC. (iii) help students who suffer from voice level barrier. Future study is required to study the relation between voice-level practice and student's ability to control voice-level.

Keywords: Voice controller, Oral communication strategy, mathematics communication

INTRODUCTION

Oral mathematical communication is the process of conveying mathematics ideas or understanding verbally by speaking it up, the art of transmitting mathematics knowledge directly to another [17]. Oral communication involves two crucial skills, listening and speaking [12]. There are various types of communication barriers when a teacher implements oral mode mathematics communication in the classroom. Refer DeVito [12], there are four types of noise, namely: physical, physiological, psychological, and semantic. Hamilton and Kroll [7] views that most physical barriers to effective listening are not directly under our control. For example, a hearing disability, noisy office equipment, or a loud conversation could prevent us from hearing an important message.

Dual Language Programme (DLP), implemented at Ministry of Education Malaysia (KPM) schools, begins from 2018 [8]. This programme is implemented under the policy of Upholding the Malay Language and Strengthening the English Language (MBMMBI). DLP gives choices to schools to use English language in teaching and learning (T&L) subjects in the field of science and mathematics. The purpose of DLP is to enhance the command of students' English language skill through increasing the English language exposure time in the subjects in the field of science and mathematics. In the form one (T1) DLP class, students at this phase are facing a drastic change of language usage in mathematics T&L, that mathematics content delivered by teacher in English language. Teacher should play an important role in order to encourage students communicate mathematics orally through implementing voice controller (VC). VC is a voice level control strategy from the volume perspective. There are past researches indicating the importance for a teacher to implement VC. Research findings of Amin, Aney Marinda, Othman and Norasmah [2] indicated that effective classroom management managed to enhance students' discipline and encouraged development in T&L. Teacher's failure in managing class would affect lesson in the respects of time and learning session interference which affected the achievement of teaching objective finally [2,14]. Hence, from the aspect of managing class voice, teacher should master student training skill so that students can control self-voice volume for keeping class's learning environment which is free from noise barrier.

Bulunuz Bulunuz, Orbak, Mulu and Tavsanli [3] evaluated the students' views regarding noise at school, its effect, and its control at two primary school (a private school and a public school) located at Bursa District. Research sampel was 432 Gred 4 students and 5, 223 from public primary school and 209 from private primary school. Data was collected through survey method by responding 20 questions. Based on the research of Bulunuz Bulunuz, Orbak, Mulu and Tavsanli [3], students' views at private primary school indicated students' voice was annoying (23.9%) and students' voice was annoying very much (24.7%); meanwhile students' views at public primary school indicated students' voice was annoying (19.6%) and students' voice was annoying very much (41.6%). The research findings show that effective education and teaching need keeping classroom voice level in specific limitation. The research findings also show that this important problem must be dealt with urgently, and substantive efforts and activities must be launched to reduce high noise levels in schools. Massonnie, Frasseto, Mareschal and Kirkham [10] found Children reporting hearing and switching difficulties experienced more interference and annoyance from noise. Children who had a greater propensity for mind-wandering also experienced more interference from noise, but were annoyed by noise only to the extent. Massonnie, Frasseto, Mareschal and Kirkham [10] suggested if one wants to foster learning and well-being in classrooms, it is therefore not enough to measure noise levels and to assess their general impact on performance through behavioral tasks (e.g., reading comprehension or mathematics). It is also important to try and identify those children who subjectively suffer the most from noise. The World Health Organization [21] guidelines for community noise recommend less than 35 dB (decibel) in classrooms to allow good teaching and learning conditions. Refer to WHO [21] again, impairment of early childhood development and education caused by noise may have lifelong effects on academic achievement and health. Nashrah et. al [15] conducted research regarding voice elements of 10 lecturer teaching Office Administration I & II, Diploma in Office Management and Technology. Result shows that 90% of the lecturer use variety of tone, 50 % use appropriate pace and 80% use proper volume during classroom teaming session. Effective communication in classroom learning is important and it presumed to be beneficial for the learning process. The learning process through classroom learning depends on the lecturer's voice elements. With right practice and delivery' of the voice elements, it will increase understanding, creating meaningful and successful learning experience. Ochoma and Marilyn [16] studied the quality of teacher's voice in teaching. The aspects discussed include: pitch, volume, tempo, articulation, pronunciation and fluency. It was concluded that teachers need to learn how to use their voices by constantly practicing and improving on the quality. It was therefore recommended that: voice training should be part of the curriculum of teacher education; in-service training on vocal delivery should be made available for practicing teachers across the various tiers of the educational system, and that teachers on their own can enroll for voice training exercises, listen to good speakers, in order for them to improve on the quality of their teaching voice.

Teachers are facing challenge in teaching mathematics T1 DLP as Moses and Malani; Nadiah and Melor [11,13] found that teachers have positive perception towards DLP implementation. However, teachers face challenges such as lack of teaching resources and facilities; most of the students do not

understand what is being taught by teachers and content; students are not familiar with the English terms; students are difficult to remember the new words/terms. Hence, teacher should implement VC strategy during T&L activities so that messages in English can be listened by all the students clearly. Research regarding analysis of VC implementation is to answer three research questions: What is the goal for teacher implements VC in teaching mathematics T1 DLP? How does teacher implement VC in teaching mathematics T1 DLP? What is the problem faced by teacher during the implementation of VC in teaching mathematics T1 DLP? Three research questions are illustrated in the conceptual frame of VC in Figure 1 which constructed from communication theory of Shannon dan Weaver [18]; communication model of Tubbs and Moss [19], and interpersonal communication model of DeVito [4]; language learning theory including social cognitive theory of Vygotsky [20] and theory of constructivism; and sound concept of Alten [1].

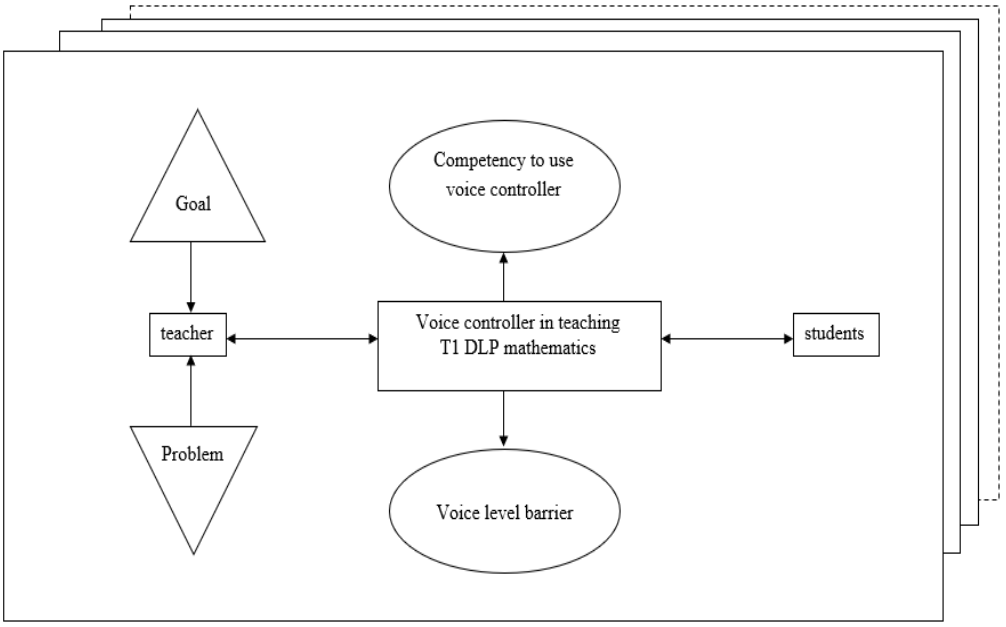

Figure 1. Conceptual framework

VC is one of the strategy components to encourage oral communication mathematics in group of T1 DLP students in order to achieve the goal of oral mode communication mathematics which can be divided into three domains: cognitive, affective, and psychomotor, by means of increasing constructing voice and decreasing disturbing voice. Cognitive level includes level of knowledge, understanding, application, analysis, synthesis, and evaluation; Affective level includes level of receiving, giving response, evaluating, organizing, and categorizing; Psychomotor level includes level of imitation, manipulate, accuracy, articulation, and naturalization. Refer to sound concept Alten [1], sound has various loudness. Based on Alten [1], researcher divides T&L voice volume level in measurement unit db: silence (0 db), conversation (20 db), group discussion (30 db), class discussion and speech (50 db). Participants' VC implementation is studied according to three elements, namely: sound level and voice level practice (SL-VL-P); marker and voice level practice (M-VL-P); and activity and voice level practice (A-VL-P), stated as Table 1.

Table 1. VC's elements

Element	Description
1. Sound level and voice level practice	Practice so that students can connect sound level with voice volume which is suitable with the situation. Voice level consists of silence, conversation, group discussion, class discussion, and speech.
2. Marker and voice level practice	Practice so that students can connect marker such as teaching tool with voice volume which is suitable with the situation. Voice level consists of silence, conversation, group discussion, class discussion, and speech.
3. Activity and voice level practice	Practice so that students can connect oral activity with voice volume which is suitable with the situation. Voice level consists of silence, conversation, group discussion, class discussion, and speech.

None of us is born a competent communicator [5]. VC is a classroom control technique which on purpose to control oral mode communication in mathematics T&L voice level through common practice. When learning a behaviour that is new, a fixed-ratio schedule is always best, while a variable-interval schedule is extremely resistant to extinction [9]. VC drills students to be obvious to four T&L voice level. Silence refers to voice level situation where has no conversation voice, the role as an audience should be played by all students in the class. Some oral activities which need silence are demonstration, explanation, written test, and silent discussion. Researcher has the opinion that time taken to wait students' response to a certain question, especially complex question, voice level silence is required to let student think for solution without interference. Conversation is voice level at phase that is heard by partners nearby only. Conversation is required when there is group discussion in pairs. Voice loudness level for controllable conversation is around 40 dB [1]. Discussion includes small group discussion and class discussion. Small group discussion voice level is voice level can be heard by a group of members such as in the jigsaw activity in the cooperative learning. Meanwhile class discussion must be heard by all individuals in the class. Activities such as brainstorming, forum, project presentation, and the session of question and answer. Voice level required is the same with speech. Speech is voice level condition which speech works. The voice level must be able to be heard by all individuals in the class, such as class discussion. Oral activities which require speech voice level are storytelling, speech, debate, and a talk. In oral mode communication, teacher needs to drill students to distinguish various voice levels. Students' voice level practice is performed so that students will be able to practice voice level which is suitable for the related situation or activity.

METHODOLOGY

This study is qualitative research. The research design is based on the multiple case research design of Yin [22]. Data collection methods are interview, classroom observation, and document analysis. Purposive sampling method are used in this study. Research participants were T1 mathematics teachers: Cikgu Sara (G1), Cikgu Priya (G2), Cikgu Chia (G3), Cikgu Aishah (G4), and Cikgu Lee (G5) at national-type secondary schools (SMK) Daerah Kinta Utara who fulfilled the qualifications for teaching DLP Mathematics as stated in the KPM's circular letter: DLP Implementation Guideline [8].The participants were selected as their schools offered DLP class, they are qualified DLP teachers, and they participated in the study out of willingness. The interview protocol and classroom observation checklist were constructed. After getting the permission from Dean of Science and Mathematics Faculty, Sultan Idris University of Education, Education Planning and Research Division, KPM, Perak State Department of Education, and Kinta Utara District Department of Education, researcher began a pre-teaching interview session with G1. Pre-teaching interview was carried out with G1 before every G1 classroom observation. Researcher ran the interview by three phrases: building up relationship and familiarity, discovering, and making conclusion as a closure. At the mean-time, G1 was given confidentiality guarantee. The interview was recorded by researcher using digital voice recorder. All data regarding teaching objective plan, teaching method, and assessment strategy could be found out at this phrase. Researcher threw structural interview questions to G1. G1's teaching plan could be recognized by referring G1 daily lesson plan (RPH). These structural questions were uniformed for all

the participants. The interview was transcribed. At the following phrase, researcher conducted G1's classroom observation. Every participant should undergo three classroom observation at the early suggested plan. What was heard and thought by researcher was noted at a checklist. G1's teaching was recorded using pocket digital voice recorder. Researcher collected back the pocket digital voice recorder after classroom teaching. The record product was transcribed. Researcher listened carefully and identified the students who gave responses by referring student-seat plan in the classroom.

Next, post-teaching interview was run for G1. Through non-structural questions, researcher ascertain the accuracy of the data obtained from teaching voice record. This interview was recorded and transcribed. At this phrase, researcher collected all the data for analysis. The data collection procedure was repeated for G2, G3, G4, and G5, until the collected data reached its saturation point. Three classroom observations were conducted for G1, G2, G3, and G4. Only one classroom observation was conducted for G5 due to the school closed during the period of Movement Control Order.

Researcher performed content analysis using manual coding. Data in voice record, obtained from pre-teaching interview and post-teaching interview; together with classroom observation voice record were transcribed into text form. Three transcript writers were appointed to run the transcription work. The transcripts were checked by a reviewer. The transcript was read carefully by researcher one after another for each participant. Research's data were recognized by underlining related sentence, passage, quotation of interview and classroom observation in the transcript. According to the three research's questions, data were divided into three categories, namely: VC implementation goal; implementation of VC and problem in implementing VC. Participants' RPH and products of students' work also contributed data regarding VC implementation in the study. Next, each data was coded based on code frame created. Coding categories were constructed once the first data collection started. Code frame, such as: (The number of collection method/Teacher's pseudonym/Research's questions/Categories/ The number of passages) was written as an example (T2/G1/S1/VC/12). Data were coded according to the three research's questions. The following phrase, participants analysis and cross-participant analysis were performed. Data which had been coded were collected in a data distribution table, content comparison table, and status comparison table. These tables were created to analyse VC's goal, VC implementation, and the problems in implementing VC. At this phrase, researcher tried to identify the theme from research's data which had been coded in categories. Researcher interpreted and performed the findings at the last phrase. Data were performed in the form of tables. Research's trustworthiness and validity were kept in the ways of clear writing, consistency, continuous analysis and detailed performance; colleague examination; member check; triangulation; appropriate data collection period; self-reflection; interview protocol, pilot study, and audit trail.

RESULTS AND DISCUSSION

Individual analysis for five participants stated as Table 2. Cross-case analysis shows that participants' VC goals are not holistic. The number of participants who have the VC's goal: cognitive domain (five), affective domain (four), and psychomotor domain (none). Affective domain's level is limited within receiving and giving response. Forming the whole VC 's goal is crucial for achieving the goal of Standard Based Curriculum for Secondary School (KSSM), that to produce students who have mathematical thinking based on attitude and value, together have the skill of mathematical tools application. which is mathematics and 21th century skill. In VC component: All the five participants implement VC undirectedly at component phase. From the aspect of problem in VC implementation, only two participants faced problem.

Table 2. Individual case analysis

Case	VC Goal
G1	**Cognitive domain**: Limited to level of knowledge, understanding, application, and evaluating. **Affective domain:** Receiving and giving response in oral communication. **Psychomotor domain:** None.
G2	**Cognitive domain**: Limited to level of knowledge, understanding, application, and evaluating. **Affective domain:** None. **Psychomotor domain:** None.
G3	**Cognitive domain:** Limited to level of understanding, application, and evaluating. **Affective domain:** Listening to others' speaking (receiving) in oral communication. **Psychomotor domain:** None
G4	**Cognitive domain**: Limited to level of, understanding, application, and evaluating. **Affective domain:** Act politely and give responses in oral communication. **Psychomotor domain:** None.
G5	**Cognitive domain**: Limited to level of knowledge, understanding, and application, **Affective domain:** Confident in answering (giving responses) in oral communication. **Psychomotor domain:** None.

Case	VC Implementation
G1	**SL-VL-P:** Undirectedly. **Routine class explanation:** Not implemented. **Reminder:** Giving reminder by scale. **Oral order:** Giving order to increase voice level gradually, from lower voice level to higher voice level. **Repeated conversation:** Not implemented. **Blame:** Not implemented. **Positive provocation:** Not implemented. **Questioning:** Not implemented. **M-VL-P:** Undirectedly. **Voice tone:** Enhance voice tone. **Body language:** Using hand signals. **Teaching tool:** Not implemented. **A-VL-P:** Undirectedly. **Group size plan:** Not implemented. **Activity's voice level explanation:** Remind students when should enlarge the voice volume and when it is allowed. **Oral order:** Identify the source of noise maker and take suitable action. **Motivation:** Not implemented. **Questioning:** Not implemented.
G2	**SL-VL-P:** Undirectedly. **Routine class explanation:** Giving explanation about classroom rules at the first day of meeting. **Reminder:** Giving reminder about classroom rules from time to time. **Oral order:** Not implemented. **Repeated conversation:** Ask student to repeat conversation which can't be heard. **Blame:** Not implemented. **Positive provocation:** Not implemented. **Questioning:** Not implemented. **M-VL-P:** Undirectedly. **Voice tone:** Increasing voice level; using 'angry' method. **Body language:** Not implemented. **Teaching tool:** Not implemented. **A-VL-P:** Undirectedly. **Group size plan:** Not implemented. **Activity and voice level practice:** Not implemented. **Oral order:** Ascertain class in silent state when activity in running needs thinking and attention. **Motivation:** Not implemented. **Questioning:** Not implemented.
G3	**SL-VL-P:** Undirectedly. **Routine class explanation:** Ascertain students are prepared in physical and mode before the lesson begins. Giving time to joke, but after that class should be coming back prepared for learning.

	Reminder: Giving reminder. **Oral order:** Not implemented. **Repeated conversation:** Asking students to answer, if the answer is not clear, needs repetition. **Blame:** Not implemented. **Positive provocation:** Not implemented. **Questioning:** Not implemented. **M-VL-P:** Undirectedly. **Voice tone:** Calling 'Boys!' with higher voice level. **Body language:** Using hand signals. **Teaching tool:** Not implemented. **A-VL-P:** Undirectedly. **Group size plan:** Taking consideration of group size which is suitable with activity. **Activity and voice level practice:** Not implemented. **Oral order:** Not implemented. **Motivation:** Not implemented. **Questioning:** Not implemented.
G4	**SL-VL-P:** Undirectedly. **Routine class explanation:** Not implemented. **Reminder:** Giving reminder. **Oral order:** Ask students who refuse to answer to answer question at writing board; Give order to enlarge voice volume if others can't hear; Giving order "Control voice please!" if the students forgettable. **Blame:** Not implemented. **Positive provocation:** Not implemented. **Questioning:** Questioning student when he is answering on the writing board. **M-VL-P:** Undirectedly. **Voice tone:** Not implemented. **Body language:** Ask students to put up their hands before answering. **Teaching tool:** Not implemented. **A-VL-P:** Undirectedly. **Group size plan:** Ascertain the number of members in a group which is suitable for activity**.** **Activity and voice level practice:** Not implemented. **Oral order:** Giving order; Giving response to student only explanation ends; Giving order to students to increase voice until it can be heard by all other students while class discussion or speech are proceeding. Motivation: Not implemented. **Questioning:** Testing whether all the other students can hear the voice of a student who is answering by means of asking the students who sit such a distance apart.
G5	**SL-VL-P:** Undirectedly. **Routine class explanation:** Explaining classroom rules at the first day of meeting. **Reminder:** Giving reminder about classroom regulations from time to time. **Oral order:** Not implemented. **Repeated conversation:** Not implemented. **Blame:** Giving blame if the student breaks the class regulation. **Positive provocation:** Controlling the feel of 'angry'; Using positive provocation. **Questioning:** Continuous oral communication with the student who has soft voice. **M-VL-P:** Undirectedly. **Voice tone:** Not implemented. **Body language:** Not implemented. **Teaching tool:** Not implemented. **A-VL-P:** Undirectedly. **Group size plan:** Not implemented. **Activity and voice level practice:** Not implemented. **Oral order:** Not implemented. **Motivation:** Giving encouragement to the student who fail to answer by treating method. **Questioning:** Continuous oral communication with the student who has soft voice.

Case	**VC Implementation Problem**
G1	Difficult to control students' noisy voice level of discussion when they are doing the exercises.
G2	No problem.

G3	No problem.
G4	Students make noise intentionally when there is a test.
G5	No problem.

Collectively, the findings of VC implementation are stated as Table 3 whereas the findings of VC implementation problem are stated as Table 4. Research's findings show that five participants implement VC undirectedly. The number of participants who implemented SL-VL-P using: routine class explanation (three), reminder (five), oral order (two), repeated conversation (two), blame (one), positive provocation (one), and questioning (two). (ii) The number of participants who implemented M-VL-P using: voice tone (three), body language (three), and teaching aids (none). The number of participants who implemented A-VL-P using: group size plan (two), activity's voice level explanation (one), oral order (two), motivation (one), and questioning (two). Cross participant analysis shows that five participants implement VC undirectedly. 'Giving reminder' is the common way for all participants. There is no formal VC drill for students.

Table 3. Findings of VC implementation

Element	VC Implementation
SL-VL-P	Implemented undirectedly: Giving reminder, order, blame, positive provocation, questioning, and repeated conversation.
M-VL-P	Implemented undirectedly: Using voice tone, body language and not using teaching tool.
A-VL-P	Implemented undirectedly: Planning group size, explaining activity's voice level, oral order, motivation, and questioning.

Table 4. Findings of VC implementation problem

Element	VC Implementation Problem
SL-VL-P	No problem.
M-VL-P	No problem.
A-VL-P	There is psychological barrier (students' noise during activity and written test)

CONCLUSION

Five participants do not have holistic VC goal. Five participants implement VC undirectedly at component phase. In researcher's opinion, undirect VC is teacher centred in effort of controlling class voice volume. Students receives what is intstructed by teacher in keeping wished class volume level. This is different from directed VC which is student centred. Students are given the chance for receiveing, giving responses, evaluating, categorizing and organizating self voice level control value consistently in various daily life situation. Research find there are still students unable to control self voice volume according to suitable class activity. Implications are that teachers should (i) plan holistic VC goals. (ii) plan formal VC. (iii) help students who suffer from voice level barrier.

In researcher's opinion, formal VC should be stressed so that students are drilled by scale until students to be more sensitive for voice level, namely silence, conversation, discussion and speech. Researcher's opinion is agreed by Gura and Powel [6], stating that as a speaker, you should be able to make your voice fill the room in which the audience is gathered. You should learn to control the volume of your voice to fill a large space easily without distorting your voice and without blasting down the back wall if space is limited. You can also direct certain words or phrases from your selection to impact the audience in a purposeful and artistic manner. With practice, you will learn how much volume is required and how you can achieve the greatest possible flexibility within that requirement. According to communication theory of Shannon and Weaver [18], communication model of Tubbs and Moss [19] and interpersonal communication model of DeVito [14], whether one way or two ways communication,

noise should be identified and removed from communication process in order to achieve communication goal. Noise from students' uncontrollable voice level does not interfere only the effective oral communication from happening, moreover cause physiological barrier to certain students.

ACKNOWLEDGEMENT

Researcher delivers thanks to academic supervisors, examiners, reviewers, who have given assistance in the forms of guidance, evaluation, and checking all through the study period. Thanks are delivered to participants and SMK principals too on the co-operation given.

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