



The Effect of the Team-Games-Tournament Method on Improving the Learning Ability of Student with Hearing Impairment in Multiplication Concepts

Endang Rusyani^{1,*}, Anwar Saepulloh¹, Rina Maryanti¹, Risti Ragadhita², Dwi Fitria Al Husaeni³

¹ Departemen Pendidikan Khusus, Universitas Pendidikan Indonesia, Indonesia.

² Prodi Kimia, Universitas Pendidikan Indonesia, Indonesia.

³ Departemen Pendidikan Ilmu Komputer, Universitas Pendidikan Indonesia, Indonesia.

Correspondence: E-mail: endangrusyani@upi.edu

ABSTRACTS

This study aimed to evaluate and analyse the results of mathematics learning about the concept of multiplication in students with hearing impairment. In this study, the team-games-tournament (TGT) method was used to teach the concept of multiplication to seven students with hearing impairment in an elementary school at the Special School in Cimahi through four stages of learning, namely: 1) pretest presentation, 2) learning presentation with the TGT method, and 3) posttest presentation. The results of the study showed that there was a significant increase in the ability to learn multiplication concepts using the TGT method. Therefore, the TGT method could be a suitable choice of learning method used in learning the multiplication concept for students with hearing impairment because, through the TGT method, students collaborate and teach each other in-game activities, that make the students understand the concept of multiplication easier, thus improve students' ability to learn the concept of multiplication. This research is important because it provides information about the use of new and unique media or learning methods that can be used to improve students' abilities, especially students with hearing impairments in the mathematics learning process.

ARTICLE INFO

Article History:

Received 05 Jan 2021

Revised 14 Apr 2021

Accepted 16 Apr 2021

Available online 28 Jul 2021

Keyword:

Education,
Special need,
Student with hearing
impairment,
Team-game-tournament
method.

1. INTRODUCTION

Learning mathematics is very closely related to various formulas to solve math problems. All these formulas always contain arithmetic operations, such as addition, subtraction, multiplication, and division (Bernard & Senjayawati, 2019). If students have difficulty in arithmetic operations, it is certain that these students will also have difficulty in applying other mathematical formulas (Beswick, 2007; Kellems et al., 2020). Multiplication is one of the arithmetic operations which is two levels of addition (Hendriana et al., 2019; Appelgate et al., 2020). Not a few students have difficulty understanding the multiplication concept. There is also students who only memorize multiplication without understanding the real concept of multiplication. This makes teachers need appropriate methods to teach multiplication material to students (Ulu & Ozdemir, 2018; Purwanti & Khoiriyah, 2020).

As previously explained, teaching the multiplication concept to elementary students is not easy. It takes a variety of ways and methods to stimulate students to understand the multiplication concept. This multiplication concept will be more complex when teaching to the students with hearing impairment due to communication barriers with other teacher or students (Suarsana et al., 2018; Yang et al., 2007). Compared with normal students on their ages, the achievement of students with hearing impairment is still far behind compared to normal students. Therefore, mathematics learning for students with hearing impairment cannot be equated with normal students.

Several learning approaches by applying certain methods have been developed and carried out, including experimental demonstration methods such as those carried out by Hidayat et al. (2020), Widodo et al., (2020), and Handayani et al. (2020) explain that the experimental demonstration method makes students learning difficulties or slow learning to become more focused, making it easier for them to capture and understand the material being taught and ultimately effective in improving learning achievement. Other methods such as the video based learning method (Kellems et al., 2020), the abacus method (Jadhav & Gathoo, 2018), comic media, and others can also be an option to be applied in helping the teaching and learning process of students with special needs. However, the selection of suitable and interesting learning methods also needs to be considered. Learning will take place effectively if students are in a comfortable, pleasant, and not under pressure (Winarto et al., 2020). Considering that childhood is a time of playing, then learning the multiplication concept will be fun if the method used is a method that has a fun atmosphere.

Therefore, the purpose of this study was to apply the learning method through the Team-Games-Tournament (TGT) method in an effort to improve the ability to learn the multiplication concept in students with hearing impairment. We chose the TGT method because this method is one of the learning methods to help students understand the subject matter. In the procedure, the Team-Games-Tournament method places students in heterogeneous groups then a game conducted such as a tournament regarding learning material and then an assessment is carried out. With the application of this method, it is expected that students understand the multiplication concept easily because the atmosphere is fun and not monotonous thus students are not depressed. The use of strategies using the team-games-tournament method is expected to give better and optimal results than remedial handled directly by the teacher, because learning is fun and friend relationships are usually closer than teacher-student relationships. If students can understand the multiplication concept, it will be easier for students to apply multiplication applications, to mathematical formulas, questions, and in problems solving in everyday life related to the application of the multiplication concept.

We focus on mathematics about the multiplication concept because students in the field have understood the concept of addition and how to calculate addition but have difficulty in multiplication counting operations. In fact, learning mathematical cannot be separated from the concepts of arithmetic operations such as addition and subtraction, but multiplication and division are also important. Because, the four kinds of arithmetic operations are a means of solving everyday life that will be very applicable in everyday life, the learning of arithmetic operations must begin to be applied at the elementary school level especially multiplication concept.

2. METHODS

2.1 Research objects and Locations

This study was conducted on 7 students with hearing impairment in third grade elementary school in special schools in Cimahi City, West Java, Indonesia. The sample data of the students were shown in **Table 1**.

Table 1 Sample data of students with hearing impairment studied.

| No | Name | Gender |
|----|------|--------|
| 1 | RC | Female |
| 2 | AB | Male |
| 3 | DF | Male |
| 4 | B | Male |
| 5 | AAS | Female |
| 6 | M | Female |
| 7 | A | Male |

2.2 Research Design

The design used in the experimental method of this research was through i) pre-test presentation, ii) presentation of multiplication material using the TGT method, and iii) post-test presentation. This research design was also known as the One Group Pre-test and Post-test method, which was a treatment carried out without a comparison group or control group. The pretest and posttest questions consist of 15 questions made in the form of cards. Each card consisted of one question that must be done and equipped with how to do it. For the assessment, a score of 1 is given if one of the methods or answers is answered correctly, a score of 2 is given if the method and answer is correct, and an incorrect answer is given a value of 0.

2.3 Learning with Team-Game-Tournament (TGT) Method

There are 5 main stages used in the team-games-tournament method, namely:

i) Class Presentation

At the beginning of learning the teacher gave subject material in class presentation, usually done by direct teaching or teacher-led discussions. At the time of presenting, students must really pay attention and understand the material presented by the teacher, because it help students work better during group work, and during games because game scores determine group scores. In this stage, students was also given post-test questions after the teacher delivers the subject material.

ii) Team Formation

Groups usually consisted of 4-5 students whose members are heterogeneous in terms of academic achievement, gender, and race or ethnicity. The function of the group is to deepen the material with their group friends and more specifically to prepare group members to work well and optimally during the game.

iii) Games

The game consisted of questions designed to test the students' knowledge gain from class presentations and group study. Most games consisted of simple numbered questions. Students picked a numbered card and answer the questions that correspond to that number. Students who answer the question correctly get a score. This score collected by students for weekly tournaments.

iv) Tournament

The tournament was held at the end of the week after the teacher makes a class presentation and the group has done the worksheets. In the first tournament, the teacher divided the students into several tournament tables. The three students with the highest achievement was grouped at table I, the next three students at table II and so on. This tournament stage is the final stage to assess the success of the TGT method where the pretest is carried out at this stage.

v) Team Recognize

The teacher announced the winning group, each receiving a certificate or prize if the average score meets the specified criteria. The team got the nickname "super team" if the average score was 45 or more, "great team" if the average score was 40-45 and "Good Team" if the average score was 30.

2.4 Data Analysis

Then, to test the hypothesis to determine the comparison between students learning outcomes before and after the TGT method was carried out, we conducted quantitative and qualitative data analysis. For quantitative data processing, we chose the data processing method using non-parametric Wilcoxon test statistics, because the research subjects were not too many and the data processed was ordinal scale using the IBM SPSS statistical software for windows.

3. RESULTS

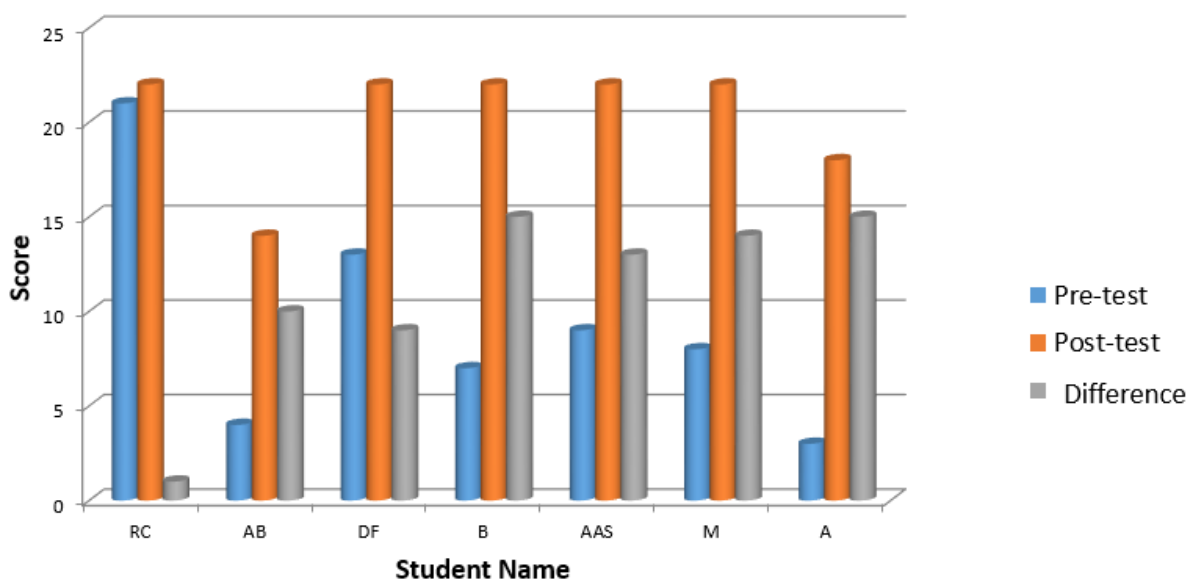
The results of the multiplication concept for students with hearing impairment using the TGT method were analyzed from the results of the pre-test and post-test scores obtained. **Table 2** shows the pre-test and post-test scores after students with hearing impairment were given a case on the multiplication concept.

Figure 1 is a graph of the difference in pre-test and post-test scores to confirm the results in **Table 2**.

Based on **Table 2**, the average pre-test and post-test scores are 9.28 and 20.28, respectively, with a gain value of 11. **Figure 1** shows a significant difference in the learning outcomes scores of the multiplication concept before and after the students were given the intervention. It can be seen that all students experienced an increase in their ability to recognize the concept of multiplication after the learning process was carried out using the TGT method.

Table 2 Student learning outcomes with TGT method.

| No | Student Code | Pre Test Score | Post Test Score | Gain (d) |
|----------------|--------------|----------------|-----------------|----------|
| 1 | RC | 21 | 22 | 1 |
| 2 | AB | 4 | 14 | 10 |
| 3 | DF | 13 | 22 | 9 |
| 4 | B | 7 | 22 | 15 |
| 5 | AAS | 9 | 22 | 13 |
| 6 | M | 8 | 22 | 14 |
| 7 | A | 3 | 18 | 15 |
| Total | | 65 | 142 | 77 |
| Average | | 9.28 | 20.28 | 11 |

**Figure 1.** Differences in each student's pre-test and post-test scores.

Furthermore, to reconfirm the results in **Table 2** and **Figure 1**, the pre-test and post-test scores were analyzed using the Wilcoxon statistical method. **Table 3** shows the results of the Wilcoxon test. The Wilcoxon test aims to test the difference between two paired data, with the same number of samples. The following is the Wilcoxon test data using a significant level of ($\alpha = 5\%$) with the null hypothesis and hypothesis 1 as follows:

H_0 = There is no effect of using the TGT method on learning outcomes to recognize the multiplication concept.

H_1 = There is an effect of using the TGT method on learning outcomes to recognize the multiplication concept.

The highest increases was obtained by students A and B which was 15. At the pre-test, A and B got the lowest score because they did not know about the concept of multiplication thus they solved the multiplication problem with origin and without enthusiasm. However, after several lessons were carried out using the TGT method, students A and B had no less enthusiasm than other students and this TGT method succeeded in increasing their understanding of the multiplication concept.

Table 3. Wilcoxon test results on the Pre-test and Post-test values.

| No | Students | Pre-test Score | Post-test Score | Gain | Rank | Rank with sign | |
|--------------|----------|----------------|-----------------|------|------|----------------|------------|
| | | | | | | Positive | Negative |
| 1 | RC | 21 | 22 | -1 | 1 | | -1 |
| 2 | AB | 4 | 14 | -10 | 3 | | -3 |
| 3 | DF | 13 | 22 | -9 | 2 | | -2 |
| 4 | B | 7 | 22 | -15 | 6,5 | | -6,5 |
| 5 | AAS | 9 | 22 | -13 | 4 | | -4 |
| 6 | M | 8 | 22 | -14 | 5 | | -5 |
| 7 | A | 3 | 18 | -15 | 6,5 | | -6,5 |
| Total | | | | | | | -28 |

The next highest increases was obtained by student M, which was 14. M was a student who had a high sense of selfishness when learning. If M does not know and does not understand the questions, M prefers not to do the questions rather than asking first. This made him filling in some questions during the pre-test. After several times of learning with the TGT method, student M was able to know, understand, and calculate the concept of multiplication so that when the post-test student M got a maximum score of 22.

AAS got an increases of 13. AAS is a smart student but does not know about the multiplication concept thus when the pre-test questions are given AAS fills in several questions with the same answer and gets a score of 9. After being given several lessons with the TGT method, AAS begins to understand the concept multiplication so that when given a post-test, AAS can answer all the questions correctly and get a score of 22.

DF got an increases of 9. When given the pre-test DF got a score of 13. DF did not know the multiplication concept thus the answer was not optimal. DF is a smart child and very active in learning. When given a learning intervention with the first TGT method, DF immediately knew and understood the concept of multiplication. DF's ability to calculate multiplication is much better than his other friends. This can be seen when the implementation of the games during the TGT method, DF always wins and answers correctly.

AB got an increases of 10. At the pre-test AB got a score of 4 because AB still had difficulty in the calculation process and did not know the multiplication concept. When carrying out the pre-test, AB did not work seriously because AB still had difficulty calculating the results of arithmetic operations whose number was more than 10 and had difficulty answering the questions given. When the learning process with the TGT method takes place, AB follows the learning process well. Although AB still has difficulty in calculating multiplication, AB already knows the multiplication concept. This was proven when the post-test was carried out, AB indeed had difficulty in calculating quite a lot of numbers, but AB was able to fill in questions regarding the concept of multiplication.

RC got an increases of 1. When carrying out the pre-test RC worked on the questions quickly because RC already knew the multiplication concept in advance compared to his other friends. RC got the highest score during the pre-test, which was 21 where the maximum score was 22. When implementing the learning using the TGT method, RC was more careful and thorough in doing the questions. In the post-test, RC can do all the questions correctly and get a score of 22.

4. DISCUSSIONS

Based on the results of the qualitative test presented in **Table 2** and **Figure 1**, the use of the TGT learning method has an effect on increasing learning outcomes in recognizing the concept of multiplication in students with hearing impairment because the post-test score after being given treatment has increased from the pre-test value where learning is still using the lecture method. The results of the quantitative test (Wilcoxon test) shown in **Table 3** also confirm that there is a significant effect of the TGT method in improving learning outcomes of multiplication concept in students with hearing impairment.

The use of the TGT learning method in learning to recognize the multiplication concept stimulates the enthusiasm and learning motivation of students with hearing impairment. Students collaborate in teams and teach each other. A fun learning atmosphere makes children excited in learning and understanding multiplication problems (Öztürk & Kalyoncu, 2018). However, sometimes there are also some students who cry when he loses. When that happened, friends and teachers gave motivation thus even though they had lost, students had the desire to understand the concept of multiplication even more strongly, this was what made students motivated for understand the multiplication concept.

This TGT method emphasizes that learning is not only limited to learning facilities, but this method can also meet the expectations of the active learning model because this method requires students who initially are less willing to ask questions, are reluctant to answer teacher questions, are less enthusiastic in learning, and are passive in discussions to become active learners (Öztürk & Kalyoncu, 2018; Gazali, 2016). Active during learning activities so as to support the success of student learning itself. The active learning process of the TGT method is able to optimize and keep students' attention focused on the ongoing learning process because active learning includes various ways to make students active from the start through activities that build group work and in a short time make them think about subject matter (Öztürk & Kalyoncu, 2018). Based on Gazali (2016), TGT learning model is a cooperative learning model where shared attitudes or behavior in working or studying are strongly influenced by the involvement of each member of the group itself. The results of the studies in reference (Öztürk & Kalyoncu, 2018) also stated that there were differences in student learning outcomes between students who were treated with the TGT method and were not given the TGT method because the TGT method could stimulate students to think actively, while students who were not given games tend to be lazy to learn.

Therefore, the TGT method becomes an effective method as a cooperative learning model that is easy to apply because in the process it includes the activities of all students in a fun way because of the game element. In addition to fostering collaboration between students due to learning involvement, the TGT method is also able to foster a sense of responsibility and healthy competition in learning (Öztürk & Kalyoncu, 2018). From the results of the study, the TGT method can be used as a reference in order to meet learning expectations. Because if the learning method is only done with conventional methods or lecture methods, learning becomes less interesting. Even based on the reference (Rusyani *et al.*, 2021) shows that learning conventional methods is sometimes boring thus it requires certain skills to implement it because in this method the teacher only gives presentations and students are required to respond or take notes on explanations from the teacher which makes students tend to be passive.

Based on the results of this studies, the advantages of this TGT method are: 1) each group has richer thoughts and understandings than individual understanding, 2) triggers student motivation because they are motivated by the presence of other group members, 3)

each member becomes active in discussions because they feel free to express themselves and their minds in small groups, 4) able to produce better decisions because it involves all individuals in the group, 5) participation in discussions improve self-understanding and others because it involves the role of children as peer tutors, 6) the learning process is fun because it contains elements games and awards (Pangestuti et al., 2015). However, in the end, the success of this research is also undeniable because it is motivated by several internal factors, namely intelligence abilities of the students themselves because this method stimulates students to think quickly, carefully, and precisely (Mulyanto et al., 2018). Another internal factor is the interest and motivation of students to learn themselves, students show interest in the application of this TGT learning method. Both of these things certainly play a role in student learning outcomes. The role of the teacher is no less important than the role of the students themselves because the teacher must have a very large role to organize the class and must be able to package a good learning design starting with careful teaching preparation in order to attract students' attention thus students are active in learning (Sugiata, 2019). Through the unique learning method provided by the teacher, it is hoped that it can awaken students from feeling bored, lazy, and sleepy. Thus in addition to internal factors, the success of the learning process is also determined by several components including the curriculum, learning models, teachers, learning media used, and learning resources (Sugiata, 2019).

5. CONCLUSION

Based on the research that has been done, it can be concluded that there is an effect of using the team-games-tournament method on the ability to learn to recognize the concept of multiplication. This increase is shown by the change in student's test results before and after being given the team-games-tournament learning method. The team-games-tournament method is a learning method in which there are games tournaments thus it stimulates students to be more active in learning and working together in groups because the team-games-tournament method involves all students to work together and communicate with each other. This is because students feel more calm, relaxed, and happy when learning and discussing with their own friends. Team-games-tournament learning method is more effective increase student's motivation to participate in learning is greater. The encouragement of motivation from the school, teachers, and parents is very important and has a big influence on increasing the ability to recognize the concept of multiplication.

6. ACKNOWLEDGEMENTS

We thank you to the supervisors who have helped us in the preparation of this scientific paper. We are also very grateful to respondents who helped us with data collection.

7. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

8. REFERENCES

Appelgate, M. H., Dick, L., Soto, M., and Gupta, D. (2020). Growing a greater understanding of multiplication through lesson study: Mathematics teacher educators' professional development. *The Mathematics Enthusiast*, 17(2), 583-613.

- Bernard, M., and Senjayawati, E. (2019). Developing the students' ability in understanding mathematics and self-confidence with VBA for Excel. *Journal of Research and Advances in Mathematics Education*, 4(1), 45-56.
- Beswick, K. (2007). Influencing teachers' beliefs about teaching mathematics for numeracy to students with mathematics learning difficulties. *Mathematics Teacher Education and Development*, 9(2007/2008), 3-20.
- Gazali, N. (2016). Pengaruh metode kooperatif dan komando terhadap keterampilan teknik dasar bermain sepakbola. *Journal Sport Area*, 1(1), 56-62.
- Handayani, D., Hufad, A., Tukimin, S., Rochyadi, E. and Nandiyanto, A. B. D. (2020). Teaching Ph of suspension containing colloidal particles suspension to students with deaf and hard hearing. *Journal of Engineering Science and Technology*, 15, 48-57.
- Hendriana, H., Prahmana, R. C. I., and Hidayat, W. (2019). The innovation of learning trajectory on multiplication operations for rural area students in Indonesia. *Journal on Mathematics Education*, 10(3), 397-408.
- Hidayat, D. S., Rahmat, C., Fattah, N., Rochyadi, E., Nandiyanto, A. and Maryanti, R. (2020). Understanding archimedes law: what the best teaching strategies for vocational high school students with hearing impairment. *Journal of Technical Education and Training*, 12(1).
- Jadhav, A. K., and Gathoo, V. S. (2018). Effect of abacus training on numerical ability of students with hearing loss. *Disability, CBR & Inclusive Development*, 29(2), 59-75.
- Kassner, K. (2002). Cooperative learning revisited: A way to address the standards. *Music Educators Journal*, 88(4), 17-23.
- Kellems, R. O., Eichelberger, C., Cacciatore, G., Jensen, M., Frazier, B., Simons, K., and Zaru, M. (2020). Using video-based instruction via augmented reality to teach mathematics to middle school students with learning disabilities. *Journal of learning disabilities*, 53(4), 277-291.
- Mulyanto, H., Gunarhadi, G., and Indriayu, M. (2018). The effect of problem based learning model on student mathematics learning outcomes viewed from critical thinking skills. *International Journal of Educational Research Review*, 3(2), 37-45.
- Nusir, S., Alsmadi, I., Al-Kabi, M., and Sharadgah, F. (2012). Studying the impact of using multimedia interactive programs at children ability to learn basic math skills. *Acta Didactica Napocensia*, 5(2), 17-32.
- Öztürk, G., and Kalyoncu, N. (2018). The effect of cooperative learning on students' anxiety and achievement in musical ear training lessons. *Journal of Measurement and Evaluation in Education and Psychology*, 9(4), 356-375.

- Pangestuti, A. A., Mistianah, M., Corebima, A. D., and Zubaidah, S. (2015). Using reading-concept Map-Teams Games Tournament (Remap-TGT) to improve reading interest of tenth grade student of Laboratory Senior High School State University of Malang. *American Journal of Educational Research*, 3(2), 250-254.
- Purwanti, K. Y., and Khoiriyah, I. S. A. (2020). The Effectiveness of jarimatika methods with tapertis media on students' multiplication concept understanding. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan: e-Saintika*, 4(3), 332-341.
- Rusyani, E., Maryanti, R., Muktiarni, M., and Nandiyanto, A. B. D. (2021). Teaching on the concept of energy to students with hearing impairment: changes of electrical energy to light and heat. *Journal of Engineering Science and Technology*, 16(3), 2502-2517.
- Suarsana, I. M., Mahayukti, G. A., Sudarma, I. K., and Yoga, I. N. B. A. (2018). Development of interactive mathematics learning media on statistics topic for hearing-impaired student. *International Research Journal of Engineering, IT and Scientific Research*, 4(6), 55-66.
- Sugiata, I. W. (2019). Penerapan model pembelajaran team game tournament (tgt) untuk meningkatkan hasil belajar. *Jurnal Pendidikan Kimia Indonesia*, 2(2), 78-87.
- Ulu, M., and Ozdemir, K. (2018). Determining the mental estimation strategies used by fourth-grade elementary students in four basic mathematical operations. *International Electronic Journal of Elementary Education*, 11(1), 63-75.
- Widodo, A. P. A., Hufad, A., Sunardi, S., and Nandiyanto, A. B. D. (2020). Collaborative teaching in heat transfer for slow learner students. *Journal of Engineering, Science and Technology*, 15, 11-21.
- Winarto, W., Syahid, A., and Saguni, F. (2020). Effectiveness the use of audio visual media in teaching islamic religious education. *International Journal of Contemporary Islamic Education*, 2(1), 81-107.
- Yang, H. J., Lay, Y. L., Liou, Y. C., Tsao, W. Y., and Lin, C. K. (2007). Development and evaluation of computer-aided music-learning system for the hearing impaired. *Journal of Computer Assisted Learning*, 23(6), 466-476.