



Developing interactive multimedia in enhancing students' listening comprehension using Moodle and Thinglink

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ABSTRACT

The effect of COVID-19 outbreak to education is in form of a shift of instructional practices from classroom-based instructions to online technology-based practices. To respond to the needs of technology-based instructional activities, this study developed interactive multimedia utilizing online technology-based platforms featuring Moodle and Thinglink to enhance students' comprehension in listening. This is a Research and Development involving fifty-three students of English literature study program in a state university in North Sumatera as object of the study. This study applies the ADDIE model to develop interactive multimedia learning. Purposive sampling was used to collect the samples for analysis. Tests, questionnaires, and interviews were designed and employed to collect the data. Material and media experts carried out the validation of the product. The paired samples t-test and independent samples t-test were utilized for data analysis. The outcomes are interactive multimedia using Moodle and ThingLink, complete with its tutorials, practices, and tests to boost the students' listening comprehension. Interactive multimedia featuring Moodle and ThingLink was deemed practical to use and effectively increased the students' listening comprehension according to the results of the material and media experts' validation and student response questionnaires.



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Massive advancements in technology have significantly impacted people's behaviour in daily life. That information and communication technology (ICT) is currently in rapid evolution has significantly affected people's lifestyles and communal demands including on education (Rizal et

al., 2021). On the other hand, due to the global COVID-19 pandemic, classroom-based instructional practices have been gradually shifted to online-learning. Many academia and education practitioners need to anticipate the effects of these changes by making use of the rapid growth of technology to optimize instructional practices in such uncertain condition.

It is evident that modern technologies enable learning-delivery transformation. Digital and telecommunication systems influence every aspect of the so-called 21st-century society and educational institutions. At the same time, the worldwide epidemic of COVID-19 has boosted educators towards the significances of using online learning for handling critical educational concerns ((Shakeel et al., 2023). It urges educators to simultaneously explore strategies for innovation and build successful online learning atmospheres for students ((Al Mamun et al., 2021; Mamun et al., 2020; Shakeel et al., 2023). Therefore, teachers are strongly encouraged to become professional educators in using information and communication technology (ICT) to plan educational advancement programs (Rizal et al., 2019).

Scholarships have proven that technology can strengthen students' concentration and focus on the given content if used properly (Hakeem Barzani et al., 2021; Okoye et al., 2023). Further, its utilization has emerged as an essential strategic instrument in advancing the achievement of educational goals (Hadi et al., 2022). Consequently, education requires appropriate technology-based learning media for teaching and learning which can address student, teacher, and parents' concerns.

One of popular uses of technology is multimedia technology. It is required to develop active, engaging, high-quality learning (Hadi et al., 2022) including in English class. As many other languages, English acquisition primarily relies on auditory perception and imitation which gradually lead to the development of listening, speaking, reading, and writing abilities. For these purposes, multimedia technology helps improve learning engagement (Djamas et al., 2018). Even Mathematics, Physics, Biology, Language, Chemistry, and Engineering are popular subjects for interactive multimedia courseware (Septiani et al., 2020).

To be specific, English is a widely-used international language, making its mastery necessary for communication in today's globalized world. In this era of globalization, students are strongly encouraged to master both hard and soft English skills to be better prepared when confronting competition or activities (Kusnadi et al., 2020). This is a huge responsibility for universities to ensure that English mastery learning can be accomplished with the highest quality by designing activities that can improve students' skills that meet recent demands. For this reason, lecturers are demanded to be able to create a classroom environment that integrates existing technology and provides

students with both hard and soft skills, such as authentic activities and meaningful tasks that improve English proficiency (Altlab & Munn, 2020).

Utilizing the most up-to-date technology applications that can support integrating technology and student skills is one of the challenges lecturers confront in classroom setting, notably listening and speaking. Listening is one of the most challenging language skills because students must be able to listen to the materials and understand vocabulary. Although listening is regarded as a passive skill, it is quite complex (Goh & Vandergrift, 2021). There are cognitive components to listening that focused attention is necessary for the listening process.

Many universities provide a learning platform using a learning management system (LMS) for every field of study as it can facilitate student and lecturer interactions (Hanafi et al., 2020). However, the use of LMS for listening class is not well designed and optimized. To meet the needs of complexity in teaching listening, various technologies were actually employed in this effort. Studies on the roles and application of technology in listening and speaking have been conducted by many researchers like the use of podcasts (Ramli, 2018; Thi Xuan Trang et al., n.d.), advanced telecommunication like skype (Dirjal et al., 2021; Levak & Son, 2017; Nasr & Mustafa, 2018) and multimedia resources (Suvorov, 2020; Datko, 2008; Sejdiu, n.d.; Gokce, 2022).

To integrate the instructional practices using LMS during covid-19, this research and development initiates to combine the use of Moodle and Thinglink. There are three reasons why these two technology-based multimedia are chosen. First, they are widely used in educational institutions during Covid-19 due to its adaptability in user control, transmission of learning content/materials, and learning assessment. Second, this interactive media development-research purposed to integrate the benefits of various LMS platforms' features to provide a more in-depth learning experience for English language education, especially in listening comprehension. Third, it also provides helpful information regarding listening comprehension materials such as vocabulary, pronunciation, grammar, and fluency through its features.

This research contributes to developing interactive digital learning media using LMS Moodle and Thinglink to enhance the quality of teaching and learning English as a second language, particularly in listening comprehension. Listening comprehension is the ability to understand spoken language and its intended meaning. This aims to enhance the quality and effectiveness of the English literature study program's instruction courses, particularly material related to listening comprehension. Therefore, it is crucial to consistently develop learning media that adapt technology to

provide students with optimal, efficient, meaningful, and readily understood learning outcomes based on evolving curriculum requirements.

METHOD

Research Design

This research uses the R and D (Research and Development) method, a form of product development involving research to produce specific goods. The R and D method was used to develop English listening learning multimedia that students could use to learn how to listen correctly and thoroughly in English. This method uses the ADDIE model. The phases of the ADDIE model are analysis, design, development, implementation, and evaluation, commonly used in developing learning media (Hanafi, 2020).

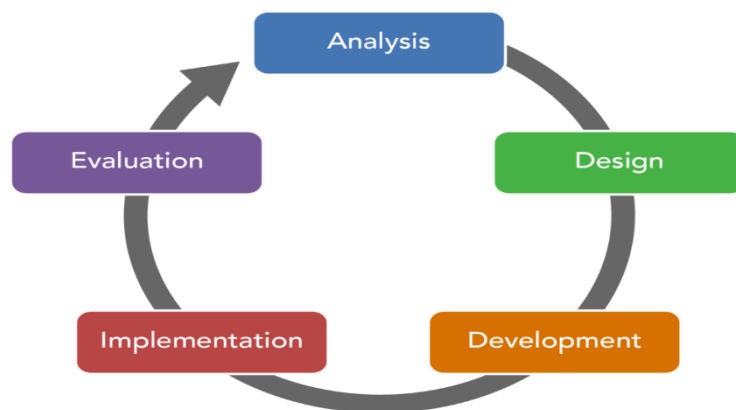


Figure 1. ADDIE Model

Source: (<https://courses.lumenlearning.com/wm-humanresourcesmgmt/chapter/the-addie-model/>)

Analysis Phase

In the analysis phase, educators collected additional information regarding the knowledge, skills, or characteristics the students must acquire and the content that must be taught to facilitate. Additionally, it is essential to properly eliminate information that does not need to be prepared to accomplish the learning objective, thereby better concentrating time and resources on essential learning needs. This, in turn, increases the students' engagement because they learn genuinely applicable information. Several techniques, such as focus groups, interviews, questionnaires, literary studies, studies with subject matter experts, and evaluations of current performance, can be used to collect data during the analysis phase (Cheung, 2016).

A need analysis defines if the skill or knowledge educators need to teach in listening comprehension is needed for work accomplishment and if students lack it. In this case, interviews were conducted with each student who would participate in creating the media design. Moreover, it asked whether interpretations of learning using interactive media and integrating the results with assessments based on a review of the collected literature were

necessary to improve the learning objectives. From all these sources, It is necessary to ensure that it is important for students to achieve basic listening competence in existing learning and then integrate the findings with the learning context to be created.

Design Phase

In the design phase, all research planning is carried out. Interactive media design tailored to the learning objectives according to the instructional design of learning in the lesson plan for the Intermediate Listening Comprehension lecture. The design is also based on the review of several literature studies from scientific articles, books, and information from several related online sites (websites). Educators set interactive digital media criteria that meet the requirements in achieving learning objectives, studying information from several experts with experience applying digital media, especially the features in Moodle and Thinglink. Design by combining the features of both platforms, arranging the structure of learning activities, and evaluation instruments for measuring the success of the development with the expectation that the developed Interactive multimedia would be appropriate for students' needs and can be maximally operationalized, which can improve students' listening comprehension skills easily, fun, efficiently, effectively and also with meaningful learning.

Development Phase

In this phase, interactive multimedia was created based on course structure planning in the design phase, which included production and evaluation. The learning management system (LMS) represents learning activities, whereas the blended or online system is a substitute for the learning method or model. Subsequently, online learning is only employed as a medium for assigning students and collecting learning activities using LMS media. As a result, several LMS features could be more optimal for use (Sinuraya & Mihardi, 2023).

Implementation Phase

The fourth phase, implementation, involves using developed products in the classroom. Forty-three learners enrolled in Intermediate Listening Comprehension courses participated in the teaching Listening Comprehension with Integrating Moodle and Thinglink experiment. The product was implemented at Universitas Negeri Medan during the third semester of the 2022-2023 academic year. The implementation employed a one-group pre-and post-test design. The duration of instruction was eight weeks. Once, a pretest was administered to students in the first week. The pretest consisted of practicing in front of the educator with various listening

materials, including vocabulary, pronunciation, grammar, and fluency. Students were given learning opportunities using the newly developed design media from the second to the seventh week. Students received a posttest with the same evaluation as the pretest in the eighth week. In this final week, students were required to complete questionnaires and semi-structured interviews to assess the learning design and use of design media. During the design phase, the evaluation instruments for the pre-and post-test were determined.

Evaluation Phase

The fifth phase, evaluation, included all media design enhancements. The evaluation was categorized into formative and summative components during the design process. Quantitative and qualitative methods were utilized for both formative and summative evaluations. The formative evaluation included an evaluation of the outcomes of expert validation and recommendations based on the difficulties educators and students encountered during the learning session.

Instruments and Procedures

Survey Questionnaire

The questionnaire aims at two ideas: first, analysing the students' needs of instructional activities in listening comprehension class; second, to analyse the quality of the product. Questionnaire was chosen for its effectiveness in gathering data from a huge number of students participating in the study. This instrument aims at revealing students' needs that include their wants, lacks, and need in listening comprehension and listening media. Two parallel classes consisting of 53 students from English Education department were involved as sources of data. They were given some items asking for their preferences towards learning instruments needed in listening comprehension, reflections or input towards the prevalent learning media, and facilities in the listening media that they expect to be available in learning listening. Inputs from the students were given in form of scales using Likert scale which measures students' choices from strongly disagree to strongly agree.

To analyse quality of the product, two survey questionnaires were designed. The first is designed for the students, and the other one is for the experts to validate the product. For students, the survey comprised ten queries regarding application, visual communication, subject matter, and language. While for the experts, testing is the final step to ensure the product meets the specified requirements. The two categories of system testing were expert validation (media and material experts) and testing students. Validation was performed to consider evaluations, critiques, and expert

opinions to produce applicable and useful learning media., particularly listening comprehension. Two experts validated the product's media and material components. Experts were given an 11-question validation questionnaire, including curriculum, content, and media.

Interview

There are two forms of interviews conducted. The first interview is addressed to students chosen randomly to crosscheck results of questionnaire distributed previously as well as to dig up deeper and more detailed information from the questionnaire. It is therefore a follow-up step of questionnaire stage. There were 10 students chosen representing the three classes. It was a semi-structured interview with list of questions as follows:

1. What is your biggest challenge in learning listening comprehension? And do you think learning media can help?
2. What kind(s) of assistances do you need in learning listening comprehension?
3. What are weaknesses of the prevalent learning media in listening comprehension class?
4. What facilities should be given when learning listening comprehension class?
5. What are the characteristics of good learning media from students as users' perspectives?
6. Do you prefer simplicity to complexity in learning media?

The second form of interview was addressed to expert validators. Two validators were invited to be involved in this study. In pre-design step, they were interviewed to obtain some insights related to the advance of technology in learning, policy, and ethics in order that the development stage can be better. The first validator is a senior lecturer from the same university who has been years teaching technology in language learning. The other validator is external lecturer who teaches in Information System department.

Observation

Field observation was conducted in the implementation process to obtain real-time information about the implementation of the learning media in Listening Comprehension class. Class B was chosen as the observed class as this class was also chosen as the experimental class where Moodle and Thinkling were implemented. Inputs from this instrument is used as an evaluation for the upcoming stage.

Data Analysis Procedures

This study started by analysing students' needs to gather information on potential problems to be solved. After that, literature review was conducted

to obtain information which solve the problems found in the analysis step. The literature review was conducted through the systematic collection of relevant research and sources and an in-depth review of topics mentioned in previous publications. The second step called design phase is where the conceptual design of the course is created. The conceptual design is derived from a literature review and field study of need analysis to meet optimal and most suitable learning experience design for students is created. The development phase involves producing the course's media content and presentation. According to the design, the material for the course's media was developed at this phase to achieve the learning objectives for the listening comprehension course. Then, during the evaluation phase, two experts with expertise in materials and media validated the product. After that, a test was carried out to evaluate the product's effectiveness, involving the participation of fifty-three university students. The design, revision, and testing phases are repeated to find design and implementation errors in the products implemented before the final implementation.

FINDINGS

This part informs the chronological phase of developing the multimedia-based learning that starts from analysis phase and ends with evaluation. This study began the development of interactive multimedia in listening comprehension courses for the university students with the analysis phase. The results of each instrument are presented and the analysis to the result is integrated within.

The educators determined the students' educational requirements that follows Dagnev (2022) and Heong, et al, (2022) principles in research and development. This phase includes structuring learning objectives and determining what is required to accomplish learning objectives. In the next step called design phase, the educator created a plan that describes how to deliver instruction to accomplish the goals identified in the analysis phase. In the development phase, each instructional component is planned in as much detail as possible to satisfy the learning design created in the design phase. Before implementing smaller experimental projects, educators provide instructions during the implementation phase. Finally, the educator receives feedback about the product and modifies the instructional program accordingly in the evaluation phase.

Analysis Phase

We then identified these as skills that our students need to improve—then analyzed learning management systems that can use interactive media to provide the most appropriate, effective, and efficient learning features. After several reviews, Moodle and Thinglink were selected as learning

management systems and integrated to develop interactive media for learning listening comprehension. Table 1 shows demographic of the participants involved in this study.

Table 1. Participants' demographic

Description	Frequency	Percentages
Class		
22B	24	45,30
22C	29	54,70
Gender		
Male	13	24,50
Female	40	75,50
Age		
17	4	7,50
18	31	58,50
19	17	32,10
20	1	1,90

Table 1 shows data that there were 53 participants, consisting of 2 classes, with the percentage of participants in class 22B = 45.30% and class 22C = 54.70%, where male participants were 24.50% and female participants were 75.50%. The age range of participants is between 17 and 20 years old, with the greatest proportion of participants aged 18 being 31, or 58.50% of the total number of participants.

Table 2. Need analysis questionnaire items.

No	Item description	Percentage				
		SA	A	N	D	SD
1	I know the use of digital applications or digital media in learning	(12)22,60	(28)52,80	(12)22,60	(1)1,90	0
2	I am interested in using applications or digital media.	(20)37,70	(23)43,40	(10)18,90	0	0
3	Applications and digital media can help me understand learning materials.	(20)37,70	(22)41,50	(11)20,80	0	0
4	I like applications and digital media that contain learning materials equipped with pictures.	(25)47,20	(23)43,40	(5)9,40	0	0
5	I like apps and digital media that contain learning materials equipped with sound or audio	(21)39,60	(26)49,10	(6)11,30	0	0
6	I like applications and digital media that contain learning materials equipped with videos	(22)41,50	(26)49,10	(5)9,40	0	0

7	I like applications and digital media that contain learning materials complemented by interactive activities (such as games)	(22)41,50	(22)41,50	(4)7,50	(4)7,50	(1)1,90
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Notes: SA = Strongly agree, S = Agree, N= Neutral, D = Disagree, SD= Strongly disagree,

The data in Table 2 shows that most respondents have a large enough interest or passion in learning using interactive digital media. Furthermore, respondents gave the largest percentage in the "Agree" and "Strongly agree" options in the questionnaire items. These results are similar to information from various literature studies on the outcomes and benefits of using interactive media in learning.

Design Phase

Four main topics were included in developing interactive multimedia in the course based on skills needed by students, namely vocabulary, pronunciation, grammar, and fluency. These topic presentations were completed using students' guidebooks, audio-based learning, video-based learning, immersive learning tools, and formative evaluation with interactive media using Moodle and Thinglink features with the required characteristics of technology development in listening comprehension learning. This research also adopts some findings from previous research. In designing the media, the educator noticed that in video-based listening comprehension activities for EFL (English as a foreign language) learners, the no subtitle and dual subtitle groups learned vocabulary significantly better than the English subtitle group (Hao, 2022).

The type of media in course structure using Moodle as the main LMS, using features such as a personalized dashboard, file management, progress tracking, multimedia integration, auto-grade examination, and peer assessment was designed. It is integrated with Thinglink as a support with features such as image/video hotspot, 360 virtual images, immersive reader, virtual tour design, and image and video library. Developed Interactive multimedia using Moodle and Thinglink is displayed in Figure 2.

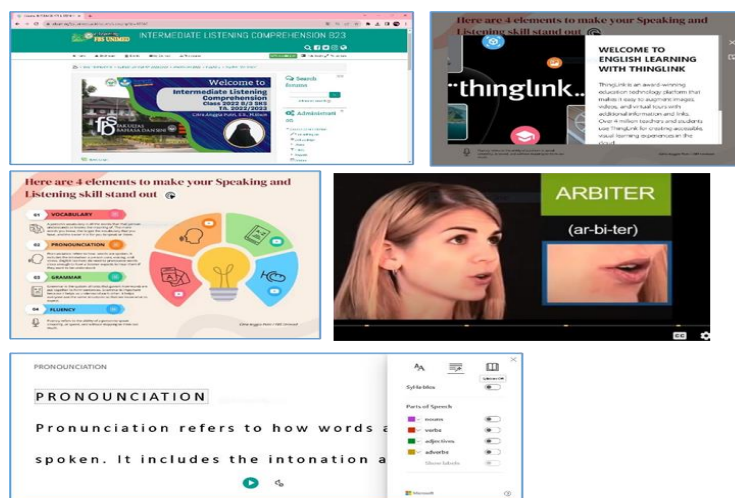


Figure 2. Developed Interactive multimedia using Moodle and Thinglink

Secondly, the educator designs the learning steps to include student activities in the learning management system created by the educator. Students must follow all sessions that consist of activities in Moodle and Thinglink, such as listening and then memorizing the selected vocabulary repeatedly, understanding the correct pronunciation of words by listening to audio recordings and video tutorials, understanding the grammatical function or error used in a conversation, and tips and trick to become a fluent listener. If there are any mistakes or problems, the educator will correct and clarify them directly. Also, the evaluation tools have to be created, including the instrument of validity based on expert opinion using a validation form for media and material factors. An observation sheet of students' performance in following the lesson structure to assess the extent of change in student competence, using design assessment questionnaires, semi-structured interview forms, and media to collect student responses and perceptions after the implementation of learning.

Development phase

This phase focuses on developing the designed features into reality. Menu for acquiring listening comprehension consist of a submenu of topic options, an introduction, and a submenu of topic options. This menu includes images, text, and videos. They were associated with vocabulary, pronunciation, grammar, and fluency in listening abilities. The practice and evaluation menus are specific to auditory comprehension. The students must master all of the listening lessons, which must be done through correct practice so that the educator can conduct the assessment through direct observation; however, the system is still used to assign grades. The Practice menu focuses on material-related questions by presenting an audio or video and asking the

student for the correct interpretation of the audio or video. This evaluation will be integrated into the scoring management system.

Learning activities begin on the Moodle LMS interface, where the initial learning structure is compiled and displayed, and data management occurs, including student data, test result data, and data intended for educators. Then, interactive learning materials are created by integrating the features and capabilities of Moodle and Thinglink. The design of the developed material structure prioritizes information and education and is suited to the curriculum at the applicable university.

Implementation and Evaluation

After finishing the development of the multimedia learning, the next activity is to implement the designed one for students to practice. Some evaluations were done for better multimedia in the future. The evaluation consists of expert validity and reliability, and the students' test results which can be seen in Table 3.

Table 3. Experts' Validity and Reliability

No.	Types of Tests	Media	Material
1	Experts' Validity	96%	95%
2	Experts' Reliability	0.866	0.853

The validation results by media and material experts revealed that the average validity percentage for media experts was 96% and 95% for material experts. While performing a validation check, information technology experts identified technical errors, such as non-functioning access and inadequate material in some menus. The product development team successfully resolved the problem, prompting the experts to reassess the results and confirm the product's viability. The media and material experts' reliability calculations were 0,866 and 0,853. These results showed that the product presented satisfactory quality and the instruments utilized were reliable. The data collected during this phase of validation demonstrated that the products comply with the material and media quality specifications.

A small-scale examination was administered to ten students instructed to observe the course's design. Students were required to submit a post-learning survey based on their responses to questions that accompanied the learning. The next phase of the learning trial consisted of analyzing student feedback and suggestions. These findings were utilized to enhance developed product quality and can be implemented in large-scale trials. The student survey comprised ten queries regarding application, visual communication, subject matter, and language. The results of the small-scale tests were 77%. The reliability calculations in student evaluations yielded a value of 0,725. These outcomes showed that the instruments and the products were high-

quality and reliable. In addition, it can be concluded from these results that the media could be accepted and used to teach listening comprehension in higher education English language education courses. Each phase of formative evaluation in this research and development using ADDIE was recursive.

After the lesson, the student was interviewed about the characteristics and application of the developed media for teaching listening to students. The questions included the benefits, problems, and differences between multimedia design and multimedia in general. According to the students' opinions, using multimedia to teach listening improves the quality of learning because it incorporates several components or elements. They stated that the advantage of designed multimedia was its attractiveness, which made learning more enjoyable and prevented students from becoming fatigued while studying. Another benefit is that the developed multimedia contains concise information that students can access anytime. This adaptability has improved the acquisition of listening comprehension. Meanwhile, the weakness of this developed multimedia by integrating Moodle and Thinglink still needs a good internet network. Thus, The developed multimedia has proved to enhance learning more interactive, interesting, effective, and efficient in achieving learning objectives. It is in line with (Tai, 2022). Interactive listening, peer collaboration, multimodal screen-based responses, and edutainment, such as game-based learning with genuineness, adaptability, and satisfaction for meaningful interaction, could enhance EFL listening skills.

DISCUSSION

This part includes justification to each chronological stage of developing the multimedia-based learning for listening class. It starts from analysis phase which concludes the students' needs for multimedia learning to help them improve their listening skill. Most of the students expect the use of interactive digital media in their listening class to promote their active participation in the classroom. This is in line with Septiani et al. (2020) who promote the use of interactive multimedia-based learning in their listening class to promote students' participation. Yanti et al. (2023) also project their students' wants towards the use of digital technology in listening classroom during Covid-19. This finding urges the availability of audiovisual provisions within the multimedia to support students' comprehension towards the material.

Additional facility might include chatting which enables students to interact during instructional practices including sharing ideas, meaning negotiation, or other possible activities which support their cognitive development. Some scholars (Hardiah, 2019; Intan et al., 2022; Kirana, 2016;

Isnaini et al., 2020) who promote the use of audiovisual techniques in listening class found that audio-visual provisions in teaching listening help students anticipate the content by taking a look at the context of communication. It shows that audio-visual media is significant and therefore, Moodle and Thinglink designed as the multimedia learning include audio-visual elements in its products. Development phase suggests collaboration and adherence towards ADDIE step in producing high-quality learning media. Tests and validity in the final step shows that the use of Moodle and Thinglink is effective in improving students' listening skill. This is in line with experimental studies conducted by some experts who support the use of that multimedia learning in listening class (Najhah et al., 2020; Hoang & Ngoc, 2021).

The process taken in this study has proven the benefits of applying Moodle and Thinglink in Listening class in the EFL context which come from experts students, and teachers. It is convincing that this multimedia learning product is beneficial for students' listening improvement. Therefore, this product is categorized as successful and suggested to be used in listening class for wider objects.

CONCLUSION

This research produces interactive multimedia for learning listening comprehension classes. The students were requested to complete learning materials using developed interactive multimedia in this research including vocabulary, pronunciation, grammar, and fluency. The developed interactive multimedia using student-centered learning methods involves students bringing up some characteristics, such as responsibility, creativity, initiative, honesty, and motivation in learning. Because this interactive multimedia has never been developed for practicum courses in the English literature study program, they must be utilized repeatedly to determine their effectiveness. The steps carried out in this research are limited for a research population learning English. However, the result of the experiment shows that the developed interactive multimedia needs to be used in study programs within the same department in English language education.

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