

## **Development of Podcast Learning Media About Educational Research Methods for Mechanical Engineering Education Students**

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### **ABSTRACT**

This research aims to develop a podcast-based audiovisual learning media on the basic concept of educational research methods for students of the Department of Mechanical Engineering Education, Faculty of Engineering, UNJ, with its validation tested by material experts, media experts, and student responses. This study uses the Research & Development (R&D) research method with the ADDIE model: Analysis, Design, Development, Implementation, Evaluation. Product validation was carried out by one material expert, one media expert, and two practice-question-grid experts. To measure the increase in student understanding by using this product, the Gain Normalisation calculation formula is used. The validation results showed a 94% score from material experts and media experts, categorized as 'Very Valid'. The practicality test showed an 88% score, while the N-Gain was 59% ('Quite Effective'). In conclusion, the developed podcast-based audiovisual learning media is highly valid and suitable as a learning resource for Research Methodology courses.

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## **INTRODUCTION**

In an era where digital technology has become an integral part of everyday life, education also faces changes, challenges, and new opportunities (Julita & Dheni P., 2022). Significant changes occurred in the use of learning facilities (Mila et al., 2021) in the process of students obtaining, processing, and understanding learning information, in order to achieve learning success (Ahnaf et al., 2021). The process is carried out using learning media.

Learning media is very important to support teacher (lecturer) materials to increase student motivation, interest, and learning success (Aditya Wahyu Wardhana et al., 2021). The use of learning media in learning will help the effectiveness of the process of delivering material from teachers to students (Ghufron et al., 2022) so that learning objectives can be achieved (Febaliza et al., 2021). In addition, Ayu Sahara (2022) stated that the position of the media during learning is able to make students more active in the learning process. Given that the use of technology as a learning medium has a crucial role (Solihatini et al., 2021). However, the learning media currently used by students as a tool to obtain

learning information still lacks technological updates, limited access flexibility, less attractive and practical to use in learning (Mayangsari & Tiara, 2019). The development of existing learning media is still limited to teaching modules, and powerpoints only, which tend to make students understand the teaching material because they have not been able to package the teaching material optimally. In the context of these problems, podcast-based learning media has emerged as one of the interesting new innovation opportunities in the world of education (Drew, 2017).

The presence of digital technology has provided a great novelty to change the learning paradigm (Dwi Apriani, 2020). In Peny Meliaty (2020), podcasts are a form of digital technology that allows the presentation of learning content in audio format that can be downloaded and accessed by students anytime and anywhere. Podcasts are an effective and efficient learning medium (Suriani et al., 2021). However, over time, podcasts are no longer required to be in audio form, but can be presented in audiovisual form in the form of video (Meng, 2005) and can be enjoyed on free streaming video provider platforms such as Youtube (Fatimah et al., 2022). Podcasts offer flexibility and flexibility that changes the way students access learning materials and replaces conventional learning methods (Bimantara et al., 2024). In addition, when used wisely, podcasts or podcasts can improve the quality of student learning success, facilitate material understanding, and motivate them to learn in various course learning (Goldman, 2018).

As a course with a high level of rigor and understanding, the Research Methodology course presents an interesting and challenging learning experience (Hikmawati Fenti, 2020). Students are taught to be able to compile research reports or observations using various scientific research methods (Fitriyah et al., 2022). However, from the observations made by the author in the Mechanical Engineering Education Study Program, Faculty of Engineering, State University of Jakarta (UNJ), it is known that many students feel that the process of learning material in the Research Methodology course cannot be absorbed optimally because of conventional learning, with boring material accompanied by explanations in the form of lectures that are only carried out during class, dominated by lecturers who are more active than students (Pratama et al., 2021). It was also found that there is still a lack of supporting learning media products outside the classroom, and the flexibility of access to learning media products is also a problem faced by students.

The facts that exist based on a preliminary study through an online form with a google form conducted by the author online to 36 students who are and have taken the Research Methodology course (with Likert scale : (5) Strong Agree; (4) Agree; (3) Moderate Agree; (2) Disagree; (1) Strong Disagree), resulted that: 48.6% of respondents agreed and 31.4% of respondents felt moderately agreed that the learning media used in the Research Methodology course was less innovative and current (Figure 1); 45.7% of respondents moderately agreed, 31.4% of respondents agreed, and 11.4% of respondents strongly agreed that the learning media used in the Research Methodology course seemed boring and uninteresting (Figure 2); 37.1% of respondents agreed, and 37.1% of respondents moderately agreed

that the learning media used in the Research Methodology course lacked flexible access outside the classroom (Figure 3).

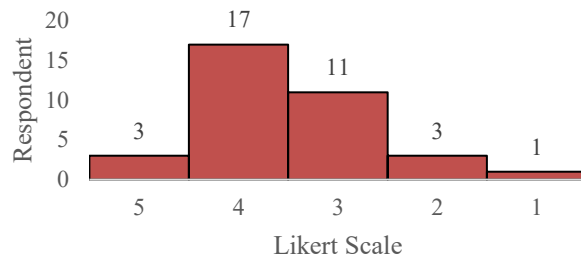


Figure 1. Results of student analysis (1)

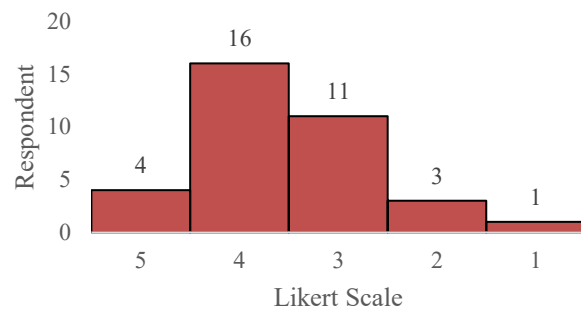


Figure 2. Results of student analysis (2)

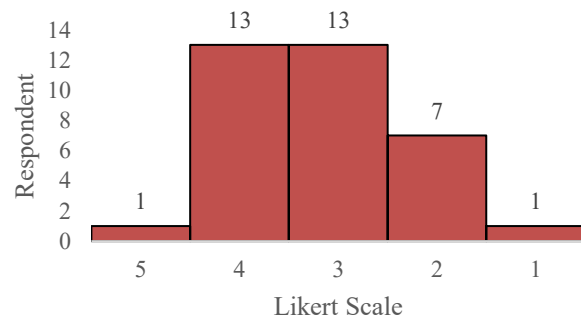


Figure 3. Results of student analysis (3)

In addition, from the results of the interview conducted by the author with the lecturer of the Research Methodology course at the Mechanical Engineering Education Study Program, Faculty of Engineering, State University of Jakarta (UNJ), Mr. Prof. Dr. Basuki Wibawa, information was obtained that the learning process is still very conventional, by only using printed modules and powerpoints accompanied by explanations in the form of lectures during the class. In addition, the length of course learning time is also not ideal enough for students to be able to understand the learning materials provided. Students tend not to be able to focus on absorbing knowledge with a learning duration of up to three hours, and constantly only listen to lecturers explain, without anything interesting, such as illustrations.

With the existence of innovative products, learning media will answer the problems that occur in the learning of Research Methodology courses. Podcast-based audiovisual learning media as one of the innovative learning media products in the digital education era which has the function of access flexibility, is practically used by students in learning outside the classroom, does not seem boring because of its attractive carrying, and is effective in increasing student learning success (Phillips, 2017). Time efficiency through learning media in the form of videos is an advantage in itself by applying techniques to shorten time (Sinaga et al., 2022). This is supported by research conducted by Anisa Bella et al. (2023) from Lambung Mangkurat University, which found that the podcast is suitable for use as a learning medium, practically used by students as a learning medium, and effective in improving student learning outcomes.

Podcast-based learning media is able to present more interesting learning materials to students (Edirisingha et al., 2009). Based on the analysis of the author's needs, it was stated that: as many as 62.9% of respondents agreed, 20% of respondents strongly agreed, and 14.3% of respondents moderately agreed to be interested in learning using podcast-based learning media in course learning (Figure 4); Also, as many as 54.3% of respondents agreed, 22.9% of respondents strongly agreed, and 20% of respondents moderately agreed with the development of podcast-based learning media products in the field of education (Figure 5).

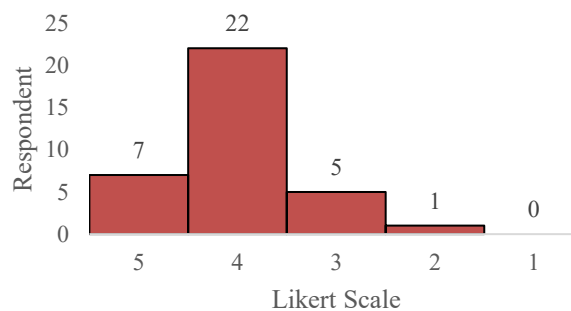


Figure 4. Results of student analysis (4)

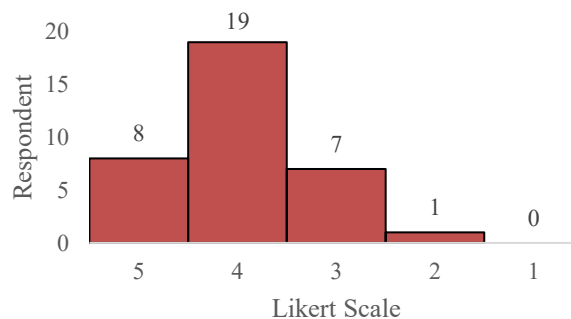


Figure 5. Results of student analysis (5)

Explaining the benchmark of the importance of podcast media in the world of education, Mark (2008) said that there are still few resources to create various types of podcast-based learning media for educational purposes, but development efforts to improve course learning in higher education are the solution.

Guidelines for learning media products made in the form of podcasts with audio/sound elements, and visuals that have object/person display elements. Information presented using audiovisuals can certainly stimulate the listener's memory nerves ation of the broadcaster and resource person in the video will increase the listener's understanding of the podcast, and the subtitles in the video can clarify the material conveyed on the podcast. Based on the initial analysis study, the material in the Research Methodology course is the Basic Concepts of Educational Research Methods material which is included and developed into a podcast-based learning media. Thus, the product specification to be developed in this study is a podcast-based audiovisual learning media on the Basic Concepts of Educational Research Methods material in the Research Methodology course.

## **METHOD**

The research method carried out in this study is using the Research & Development (R&D) method with the ADDIE development model: Analysis, Design, Development, Implementation, and Evaluation. The concept of the ADDIE model applies the concept to develop a learning product design (Hidayat & Nizar, 2021).

At the analysis stage, the researcher conducted an initial needs analysis of the problems that occurred in students who were taking the Research Methodology course. In the design stage, the researcher designed a podcast-based audiovisual learning media that will be used as a learning medium in the Research Methodology course with the material Basic Concepts of Educational Research Methods. Then, in the development stage, the researcher began to create a podcast-based audiovisual learning media by adjusting the specifications of the product developed, the development process began from writing the script, recording the podcast video with the resource person, the editing process, publication, as well as validating the media-material experts, and validating the grid of practice questions. At the implementation stage, the podcast-based audiovisual learning media that has been developed is tested in student learning in the Research Methodology course, both inside and outside the classroom. In this implementation stage, the researcher also carried out pretests - posttests to students to find out the testing of practice questions and to improve students' understanding of the material presented in the podcast. Finally, at this evaluation stage, the researcher will conduct a review related to suggestions and revisions from media-material experts on learning podcast media products. In addition, the researcher also analyzed the test data that the researcher had received and compiled a report.

The research instrument used in this study employs printed questionnaires for material and media validation by experts, with 20 questions for material experts (related to aspects of learning objectives, quality & relevance of the material, and presentation of learning materials), and 25 questions

for media experts (related to aspects of design appearance, media navigation, and advantages). Meanwhile, for the practicality test for students, an online questionnaire was used with a total of 19 questions related to aspects of learning material, media display quality, and usage. For the research instrument on the validation of the exercise question grid to the two relevant experts, it consists of 15 questions for each pretest and posttest, which have been adjusted to the course learning outcomes.

In the initial needs analysis, the research instrument used was an online questionnaire with a total of 16 questions directed at students regarding the forms of media and teaching methods that had been implemented in the Research Methodology course. In addition, interviews were conducted with the course instructors to gain further insights into the issues faced in their classroom teaching.

As for the data analysis technique in this study, the validity and practicality data of students will be analyzed using the Likert scale which consists of 5 scores with the information Strongly Agree (score 5), Agree (score 4), Sufficient (score 3), Disagree (score 2), and Strongly Disagree (score 1). The following is the formula for calculating validity and practicality.

$$P = \frac{\sum x}{\sum xi} \times 100\% \tag{1}$$

Information:

P = Validity percentage

$\sum x$  = Overall number of answers across items

$\sum xi$  = The sum of the total ideal values across items

100 = Constant

(Sugiyono, 2018)

The eligibility validity criteria can be seen in the Table 1 below:

Table 1. Interpretation of Validity Test Scores (Sugiyono, 2018)

Validity Score	Criteria
81-100%	Highly Valid
61-80%	Valid
41-60%	Quite Valid
21-40%	Less Valid
<20%	Invalid

For data analysis techniques on the effectiveness of student learning success in the development of podcast-based audiovisual learning media on the Basic Concepts of Educational Research Methods in the Research Methodology course with a pretest-posttest system using the following calculation formula:

$$\langle g \rangle = \frac{T_2 - T_1}{S_m - T_1} \tag{2}$$

Information:

$\langle g \rangle$  = N-Gain average

$T_1$  = Pretest

$T_2$  = Posttest

$S_m$  = Maximum Score

(Wahyudin et al., 2019)

Table 2. Normalized Gain Criteria (Wahyudin et al., 2019)

Value Cap	Category
$g > 0,7$	High
$0,3 \leq g \leq 0,7$	Intermediate
$g \leq 0,3$	Low

Table 3. N-Gain Score Interpretation (Hake, Richard R, 1990)

Percentage	Interpretation
<40	Ineffective
41 - 55	Less Effective
56 - 75	Quite Effective
>76	Effective

## RESULTS AND DISCUSSION

### 1. Expert Validation Results

In this study, the product developed is in the form of podcast-based audiovisual learning media on the basic concept material of educational research methods in the Research Methodology course. The learning podcast media consists of two episodes. Each episode presents materials that have been adjusted to the Course Learning Objectives Flow. Both podcast episodes are uploaded on the Youtube video streaming platform (Figure 6) for easy access to use.

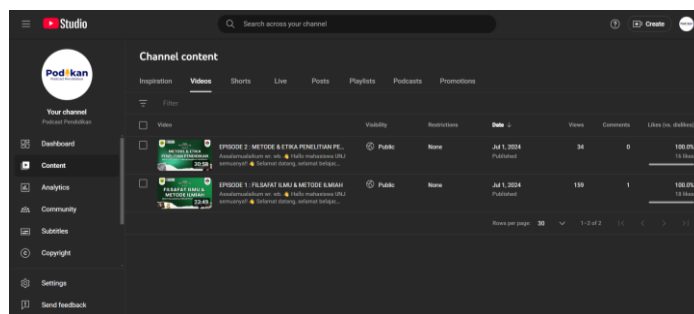


Figure 6. Youtube Channel Dashboard Display

This podcast-based audiovisual learning media has been validated by 1 material expert, namely a lecturer in the Research Methodology course with a record of Strata 3 higher education and 1 media expert, namely an education lecturer with the learning media concentration from the S1 Mechanical Engineering Education Study Program, FT UNJ. The results of expert validation are summarized in Table 4 and 5.

Table 4. Material Expert Validation Results

Learning Objectives	Material Quality	Relevance	Presentation of Materials	Score	Maximum Score	Percentage	Criteria
19	28	14	28	94	100	94%	Highly Valid

Table 5. Media Expert Validation Results

Display Design	Navigation	Advantages	Score	Maximum Score	Percentage	Criteria
62	28	28	118	125	94%	Highly Valid

In Table 4, it can be seen that the validation results from the material validators are 94% with highly valid criteria, and from Table 5 it can be seen that the validation results from the media validators are 94% with very highly criteria. Then, the two experts who validated the *grid of pretest – posttest* practice questions stated that the practice questions were in accordance with the Learning Outcomes of the courses taken, and could be used as a tool for evaluating student learning.

In addition, experts also provide comments in the form of suggestions for the podcast-based audiovisual learning media that is developed. Some of these suggestions are summarized in Table 6.

Table 6. Expert Advice

Expert	Suggestion
Material	1. The material presented can be better adapted to the needs of students in the research methodology course, it also needs to be adjusted to the learning outcomes of the course.
Media	1. Pay attention and correct the spelling of the title name that is still wrong 2. Add some illustrations in the form of videos on the material points in the learning podcast videos

## 2. Student Practicality Results

The results of field tests or practicality for students who are/have taken research methodology courses can be seen in the following Table 7.



Table 7. Results of Student Practicality Test

Total Students	Total Score	Presentage	Criteria
35	2953	88%	Highly Valid

Based on Table 7, the results of the practicality of learning podcast media to students were obtained by 88% with the Very Valid criterion obtained from the results of the response questionnaire that had been filled out by 35 students.

### 3. Testing Results of Pretest – Posttest Student Practice Questions

The results of the pretest - posttest practicality test for students who are/have taken research methodology courses can be seen in the following Table 8.

Table 8. Results of Testing Practice Questions

Total Students	Pretest Score Average	Posttest Score Average	N-Gain Presentage	Criteria
35	65.25	89.42	59%	Quite Effective

Based on Table 8, the effectiveness of learning podcast media on student learning success was obtained by 59% with the criterion of Quite Effective to increase student understanding of the teaching materials in the learning podcast, and it was in accordance with the Course Learning Outcomes.

### 4. Comparison Discussion

Here is a comparative discussion between three previous studies and the research conducted by the researcher. First, in a qualitative study by Peny Meliaty Hutabarat in the Multimedia Broadcasting Study Program, Vocational Education Program, UI in 2020, which discusses the development of podcasts as a digital-based supplementary learning medium in higher education, the research findings indicate that the use of podcasts as a learning medium in higher education in Indonesia is still limited and not widely developed. In line with the findings of the research study, the author designed, created, tested for feasibility, and implemented audiovisual learning media based on podcasts, specifically on the Basic Concepts of Educational Research Methods in the Research Methodology course, in the S1 Program of Mechanical Engineering Education at FT UNJ.

Second, in the development research titled "E-learning Content Based on Podcasts as a Means of Strengthening Research Novelty Material" conducted by Arya Hayat Bimantara et al., from Universitas Negeri Jakarta in November – December 2023, using the research & development (R&D) method following the modified 4D model, it was concluded that the use of podcast-based E-learning content can be an effective alternative in supporting the understanding of research novelty material. However, this research has a flaw in that the podcast's format still struggles to visualize the content, which prevents it from grabbing students' attention and improving their comprehension. Consequently,

in order to produce the product, the researcher revised the application of the development model, namely ADDIE. Then, the presentation of teaching materials in the research conducted by the researcher (Basic Concepts of Educational Research Methods) was made engaging by presenting various video illustrations supporting the narration in accordance with the learning material guidelines, so that students do not get bored watching the podcast and can understand the material presented in it.

Third, in the research conducted by Anisa Bella from Lambung Mangkurat University, Kalimantan, in 2023, regarding the development of audio-based podcast products for elementary school students using the ADDIE development model, which of course lacks the ability to visualize the learning material content in the product, even though the product has been deemed suitable by experts. The target audience for the podcast product developed by Anisa Bella is also elementary school students, who obviously have different learning characteristics compared to university students. Therefore, it is concluded that further innovation related to the media product is necessary, with research methods that can be used as references.

## **CONCLUSION**

Based on the results of research on the development of podcast-based audiovisual learning media (iPod Casting) on the basic concept of educational research methods, the following conclusions can be drawn:

1. The resulting podcast-based audiovisual learning media (iPod Casting) is systematically arranged and has good quality in terms of audio and visual. Thus, this podcast-based learning media is said to be suitable for use in the learning of Research Methodology courses.
2. The feasibility of learning podcasts can be known from the material expert validation test, media expert validation test and student practicality test. Here are the results:
  - a. The results of the material expert validation test on the podcast-based audiovisual learning media received a feasibility percentage of 94% with a very valid category, which can be concluded that the material on this media meets the criteria for the Learning Outcomes of the Courses taken.
  - b. The results of the validation test of media experts on podcast-based audiovisual learning media received a feasibility percentage of 94% with a very valid category, so it was concluded that this media can visualize the Basic Concepts of Educational Research Methods material very well.
  - c. The results of the student practicality test of podcast-based audiovisual learning media received a feasibility percentage of 88% with a very valid category, which practically the media can be used by students to learn, and understand the material of the Basic Concepts of Educational Research Methods in the Research Methodology course.
  - d. As a test of the practicality of pretest & posttest questions in the learning podcast product to students in order to increase their knowledge related to the material

presented in the podcast received a percentage of 59% with a quite effective category, which can be concluded that the practice questions made are in accordance with the material taught in the media, so that the practice questions can be used as an evaluation exercise for Course Learning Outcomes.

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