# Developing E-worksheet-based TPACK model for Junior High School Students in English Language Learning Context

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## Abstract

*Background:*
The goal of this study is at developing an E-Worksheet based on TPACK Model by using Adobe Animate CC and AI Voice. This research was conducted to overcome the students' problem, the teacher's problem, and instructional problem that occurred in Language classroom.

*Methodology:*
This study is a research and development project that used of the 4D development methodology. The four steps of this model's development are defining, designing, developing, and distributing. Observations, tests, interviews, and questionnaires are examples of research instruments. The e-worksheet was validated by 5 validators, including 2 material and language expert lecturers and 3 media expert lecturers.

*Findings:*
The percent formula is used to determine its practicality. The electronic worksheet is classified as very valid with the level of 84.2 % in material or content of product and very valid with the level of 85.9% in media of product. The result of the practicality of the electronic words indicated that the total mean score for all the items in the questioner was 4.5 with a percentage of 90 falling into the category of very practical. The results of the effectiveness test were obtained with a value of 0.81 in the high category.

*Conclusion:*
Based on the results of the study it can be concluded that developing an E-Worksheet in Describing words material based on the TPACK Model by using Adobe Animate CC and AI Voice for seventh grade students of Junior Islamic High School is valid, practical, and effective.

*Originality:*
The use of TPACK as a resource for creating teaching materials is quite effective

## 1. INTRODUCTION

Pedagogy, technology, and content are essential considerations when creating effective learning tools and instructional materials. These three components are included in the learning technique known as TPACK (Technological Pedagogical Content Knowledge). The usage of TPACK as a tool for producing instructional materials is quite successful (Koehler et al., 2014). Technology integration into teaching and learning can be accomplished using a framework based on TPACK, which combines three different forms of knowledge: technological, pedagogical, and content knowledge. These three elements can also be combined and applied to learning successfully in order to achieve learning goals like fostering original thought. Prior research has shown that TPACK-based learning systems can aid in the growth of students' critical thinking skills. TPACK was used in the creation of the study's student activities (Gunawan et al., 2020). Incorporating TPACK and the PBL strategy, according to one study, improved students' capacity for critical thought (Wardani & Jatmiko, 2021). The TPACK model is a teaching strategy that focuses on increasing students' motivation and engagement in learning English, especially in English. Teachers' ability to digitalize is very important for increasing competence in teaching (Roza, 2021).

Previous research has not shown how to create worksheets using the Technological, Pedagogical, and Content Knowledge (TPACK) Model. Numerous studies on the creation of worksheets for the teaching of the English language corroborate this. The first research, which aims to create worksheets for eighth-grade junior high school pupils studying problem-based learning (PBL) (Isrokijah, 2016). Realizing and achieving educational objectives requires a strong curriculum (Meldia & Melani, 2022). Concerns include the lack of exercises suitable for the 2013 Curriculum and teachers' ignorance of PBL as one of the essential teaching philosophies in the 2013 Curriculum. The curriculum can be used by language teachers as a starting point for their own original work and lesson plans (Meldia & Kardena, 2022). Furthermore, other researcher also attempted, in a different project, to produce instructive comics for students based on worksheets (Suhono & Sari, 2020). An examination of the student revealed that students who are less driven to study English are a problem.

Additionally, the other researchers conducted other studies that focused on the development of electronic-based worksheets using the lesson study-based flipbook designer program kvisoft (Erna et al., 2021) and another one also contributed to the invention of the E-worksheet (Tsiqah & Arin, 2022). The worksheet was less supportive while engaging in learning activities, which was a concern for the researcher who carried out the study.

One of the fundamental paradigms in English language instruction is learner-centered instruction, which places the student at the center of both language teaching and language learning processes (Kardena, 2022). The important component of the learner-centered instruction paradigm is that it makes students the major protagonists who decide and manage their language learning process. Additionally, the students' primary involvement has a significant impact on their entire learning process, including preparation, learning itself, and evaluation.

The researcher observes from his point of view that there are several of things that need to be further improved in terms of the further development of worksheets based on a variety of worksheet forms that currently exist and were established by a lot of previous researchers. It won't be simple to evaluate the assessment using the methods used in the previous worksheet. For students whose schools do not yet allow the free use of Android for studying, the kind of e-worksheet that can only be accessible using Android will provide a major obstacle. Additionally, the worksheet's learning strategy and development techniques, which present additional difficulties because children, for instance, concentrate just on the illustrations.

Examining more closely, we can see that the researcher's goal in this study is to create an electronic worksheet that will address current issues. This worksheet was created with the fundamental goal of stimulating students' interest in the meaning of learning itself. It did this by first simplifying the subject matter through the use of applications that will encourage students to learn, then presenting the subject matter in various ways, offering a flexible assessment system that allows for direct analysis of the results, and finally giving the subject matter a daily touch to help students internalize it. We have incorporated all the skills and elements of English learning into an e-worksheet, rather than concentrating on just one. It does more than just introduce technology; it integrates learning components that are inherent in TPACK, such as comprehension, content, and practice.

In this study, the researcher found several weaknesses related to the use of worksheets in English class. First, the worksheet seemed that the worksheet did not accommodate technology. Second, the worksheets that were used is the conventional worksheets which is less encouraging for students to be active in learning activities. Third, most of the students seemed to have low motivation. Last, student learning outcomes are low. For this research, there are four research questions, they are:

1. What were problems that occur related to the instructional material that was currently being used in learning English?

2.   What was the design of the E-worksheet for Junior Islamic High Schools based on the TPACK model?

3.   How was the students' worksheet developed?

4.   Was the E-worksheet developed valid, practical, and effective?

Therefore, this study used AI Voice and Adobe Animate CC because of Adobe Animate is an application that has very complete features because this software is a development of previous software such as Macromedia Flash or Adobe Flash software to apply Technological Pedagogical and Content Knowledge (TPACK) with seventh-grade students. This study differs from prior studies that it focused on the development of an electronic worksheet for the seventh-grade students in Junior Islamic High School, it is necessary to create an electronic worksheet based on the Technology, Pedagogical, and Content Knowledge (TPACK) Model in order to enhance students' English comprehension.

## 2.   METHODOLOGY

In this study, the researchers used the 4D model, which has four stages: (1) Define, (2) Design, (3) Develop, and (4) Disseminate (Thiagarajan et al., 1974). To collect the data, the researchers used some instrumentations; questionnaire, interview, observation, and documentation. Questioners were also utilized in the define stage to collect data on students and teachers' challenges, as well as to supplement data gathered from interviews. The closed-ended questionnaire was used to assist students and teachers in responding to the questions that have been presented. Then, the interview was being utilized as a tool to collect data during the define step. It is used to gather information about student issues, teacher issues, and instructional materials issues. Then, data on the outcomes of teaching argument before and after utilizing the E-worksheet to teach English being created were collected through observation. The effectiveness of the E-worksheet was measured by using test. The researchers validated the instruments by expert for defining, designing, developing, and disseminating steps.

After collecting data, the researchers used SPSS 29 to know about the validity, reliability, and practicality of the instruments used and the product. The subject of field testing was seventh-grade students. After identifying the normality and homogeneity of the data based on the score of the English test for Junior Islamic High School entrance test, the researcher decided which classes were used as experiment and control classes. Class A (29 students) was chosen as the experimental class and class B (29 students) was chosen as the control class. To determine how well the student worksheets for English instruction worked, the researcher ran a quasi-experimental study using a pre-test-post-test control group approach. Using the English

subject score to choose which class to use as the experiment and control class, the researcher discovered that the data were homogeneous and normally distributed. Four meetings were held to conduct the treatments. The TPACK Model-based E-worksheet was used to treat the experimental class. On the other hand, the control group did not get instruction in English via the electronic worksheet. The way English language strategies were taught to the children in the classroom was really basic.
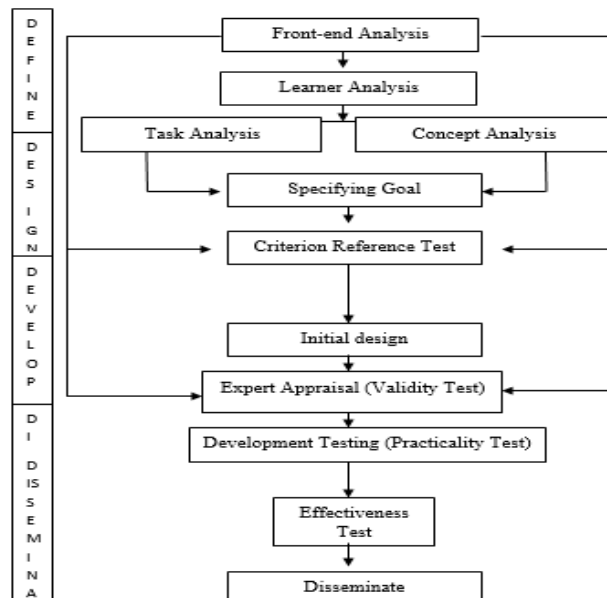


**Figure 1. Procedures for Research and Development with 4-D Model**

## 3. FINDINGS

### 3.1. Define Stage

At this phase, a response is being provided to the initial study question, "What are problems that occur related to the teaching material that is currently being used in teaching English subjects in Junior Islamic High School?" The answer to this research question explains the issues that the teacher and pupils encountered as well as issues with the necessary teaching resources. The researcher is now curious to learn more about three issues: the difficulties faced by teachers, those faced by students, and the requirements for instructional materials.

*Teacher's problem*

Classroom observations and information gathered from three teacher interviews further support the findings of the interviews, showing that teachers continue to use traditional worksheets and do not use any technologically advanced teaching tools. Students also seemed to be less eager and motivated to finish the assignments on the worksheets that the teacher had presented. The instructor made it clear at the end of the interview that technology is essential for teaching. The use of worksheets with technical components in class is one example of how

students are very interested in anything that has a technological fragrance to it. When an electronic worksheet is available, teachers agree to utilize it, and they inform students of the many amazing benefits that technology in education can provide when used appropriately.

*Students' Problem*

Learner analysis is the next analysis to be performed in this stage after front-end analysis, which is used to identify the teacher's issue. It focuses on identifying the issues and requirements of the students that are important for the creation of the instructional materials. These demands include the student's past knowledge and entry-level skills, both of which will affect how the educational materials are developed. Questioners are employed as a tool to gather data in order to achieve that. The questioner's items are connected to the target needs and learning ability. The data was validated by some professionals before to being utilized as a question before data collection. The instruments used to validate the interview and observation came before validating those methods. Instruments can be used to gather information about students' issues because the results of their validation showed that they are valid and dependable. The following figure displays the questioner's response:

**Table 1 Result of Questioner Indicating The Causes of Students' Problem in Using Worksheet**

| No | Classification | Problem | N | Mean | SD |
|---|---|---|---|---|---|
| 1 | The Need For E-Worksheet | The need for a worksheet that used video, audio, animate picture features (E-worksheet) | 83 | 51.1 | 5.81 |
| | | The importance of using electronic worksheet | 83 | 50.2 | 5.78 |
| | | An innovative worksheet based on technology | 83 | 50.4 | 5.79 |
| | | Developing the electronic worksheet | 83 | 49.9 | 5.76 |
| | | Scaffolding | 83 | 49.8 | 5.75 |
| | | The variation questions in the worksheet | 83 | 49.8 | 5.70 |
| 2 | Problems Causing English Learning Difficulties | Limited of Learning media | 83 | 50.1 | 5.61 |
| | | Limited vocabulary | 83 | 50.3 | 5.41 |
| | | Teaching method | 83 | 48.6 | 5.05 |
| | | Students' learning style | 83 | 47.2 | 4.75 |
| | | The material difficulties | 83 | 46.5 | 4.50 |
| | | Language Ability | 83 | 43.4 | 4.18 |
| | | The lack of enjoyable learning environment | 83 | 44.1 | 4.20 |
| 3 | Priorities In English Learning | Preferred topic in learning related to the student daily activity | 83 | 45.1 | 3.98 |
| | | The students use English in the classroom | 83 | 41.1 | 2.92 |
| | | The objective of learning English to be able in comprehending English subject | 83 | 39.6 | 2.50 |
| | | Difficult skill in language learning | 83 | 38 | 2.12 |
| | | The preferred skill in language learning | 83 | 36.6 | 1.87 |
| | | The frequency in using English | 83 | 35.5 | 1.76 |
| | | The more necessary skill in language learning | 83 | 33 | 1.32 |

There are three categories of issues that prevent students from using worksheets, as shown in Table 1. The first division relates to the requirement for using E-worksheets. It is divided into six parts. the need for an electronic worksheet (E-worksheet), the significance of

using an electronic worksheet, an innovative worksheet based on technology, developing the electronic worksheet, scaffolding, and the variety questions in the worksheet are all included in this classification. The second category deals with issues in learning English. It is divided into seven sections, including the difficulty of the topic, limited learning medium, limited vocabulary, and students' learning styles. Finally, it has to do with English learning priorities. It consists of seven parts: the most popular subject for learning that relates to students' daily activities; the students' use of English in the classroom; the goal of learning English to be able to comprehend English subject; the most challenging skill to learn; the most popular skill to learn; the frequency of using English; and the most crucial skill to learn.

### 3.2. Design

*Initial Design of E-worksheet*

The worksheet used constructivism approach. Constructivism is a theory that has been directly applied to the study of reading to explain how readers construct messages or comprehend during the reading process.(Tracey & Morrow, 2006) This constructivist learning theory connects students' prior knowledge with new knowledge in learning, making it easier for students to understand the material and learning activities.

Then, the e-worksheet was designed by using adobe animate CC and Artificial Intelligence (AI) voice. The establishment of artificial intelligence (AI) resources to aid language learning ought to be based on what instructors would do in actual situations of teaching and learning languages (Sumakul et al., 2022) and AI voice in e-worksheets to improve listening comprehension.

### 3.3. Develop

This stage provides a solution to the third research question, "How is the electronic worksheet developed." At this step, the product's original design and the previously identified educational items (the electronic worksheet) are updated. Validity testing (expert appraisal) and practicality testing are two activities that are intended to be utilized as a way of changing the already existing design.

### 3.3.1 Validity Test

There are 14 items used to measure the validity of the electronic Worksheet and all items for material experts are categorized as valid. The reliability of the electronic Worksheet also indicated that it is reliable. It indicated that the Cronbach's alpha coefficient is 0.750 which indicated that the internal consistencies of the items are high. Since there are two raters or valuators measuring the validity of the electronic worksheet, the agreement between the rates also indicated they have an agreement in terms of giving scores.

Then, there are 9 items used to measure the validity of the electronic worksheet and all items for media experts are categorized as valid. The reliability of the teaching model also indicated that it is reliable. It indicated that the Cronbach's alpha coefficient is 0.853 which indicated that the internal consistencies of the items are high. Since there are three raters or valuators measuring the validity of the teaching model, the agreement between the rates also indicated they have an agreement in terms of giving scores. The following chart describes the ICC score

### 3.3.2 Practicality Test

The result of the practicality of the electronic worksheet was obtained from the responds of the teacher who used the worksheet. The respond showed that the worksheet is practical since the mean score obtained is 4.5 which indicated that the worksheet is very practical. Besides, the ICC score also indicated that the score obtained is high. It is shown in the following table. The result showed the intraclass correlation coefficient of the valuators is 0.707 and it is considered high. It means that the agreement between the rates on giving score is high.

### 3.3.3 Effectiveness Test

According to the result of the independent $t$ test indicated that the result of post -test for experimental class achieved significantly higher scores for using e-worksheet based on TPACK model compared to the result of post- test for control class ($t=7.705$, $p= < 0.001$). the effect sizes were large for each variance ($d=2.02$) (Cohen, 1988). Students who adopted e-worksheet based on TPACK Model performed significantly better than those who adopted conventional worksheet in terms of the result of post-test for experimental and control class.

To conclude, the result of the analysis of the validity, practicality and effectiveness of the electronic worksheet indicated that it is valid, practical and effective in improving students' English learning ability.

### 3.4. Disseminate

The disseminate stage is undertaken as the final series of actions in the development process after the validity and reliability test that was conducted in the previous stage. The products are revised in accordance with advice provided by the advisors and valuers. Advice from the adviser and valuers was valued as a crucial component of the product development process. Therefore, certain significant product modifications are described at this point. The recommendations are divided up into different categories. They are initially laid out. It was

advised that the cover style and the entirety of the products match the worksheet's syntax. As a result, the researcher altered the product's layout in accordance with the proposal.



**Figure 1 Revision of the Lay Out of E-Worksheet**



**Figure 2 Students' Activity by Using E-Worksheet**

The suggestion regarding the product's substance is the second component of the valuator's suggestion that served as the foundation for the change. There have been some comments made regarding the electronic worksheet's content, suggesting that it needs to be improved. The images below display the revision.

## 4. DISCUSSION

### 4.1. The teachers' and Students' Problem

The define stage of the development process revealed important facts related to problems that students have in English subject. Both students and teacher indicated that problems in using the worksheet were very much related to the need for electronic worksheet. Limitation features are used in the previous worksheet make both teacher and students have obstacle while teaching and learning. Furthermore, the students have an assumption that they need to have an electronic worksheet that give them more interactive features; such as video,

audio for listening, animated picture, interesting material, and variation of tasks. Those features did not cover in the previous worksheet. Therefore, the students need for electronic worksheet to help them in learning English better. Another important fact revealed in this stage is both students and teacher stated that problem in English is caused by the limited used of media used in learning.

Moreover, the students prefer the content of the students' worksheet to relate their daily activities, they quickly assimilated the material they were taught. This helps teacher in activating students' background knowledge. Finally, the important aspect revealed in define stage is the fact that the teacher was not using specific worksheet to deal with the student's problems mentioned above. The availability of worksheet in this situation is crucial. The electronic worksheet helps students to learn effectively. The need to design the electronic worksheet brings the researcher to also design lesson plan as other instructional product that support the electronic worksheet.

## 4.2. The design of the Electronic Worksheet

The problems which were indicated in the previous stage leads the researcher to propose the electronic worksheet. This E-worksheet was designed by using adobe animate CC and Artificial Intelligence (AI) voice. The establishment of artificial intelligence (AI) resources to aid language learning ought to be based on what instructors would do in actual situations of teaching and learning languages (Sumakul et al., 2022). The electronic worksheet is Adobe Animate is a type of technology-based multimedia. The use of AI in language learning environments has been found to benefit students in the following ways: by facilitating meaningful communication (Lu, 2018); by assisting collaborative roles(Tafazoli et al., 2019); by enhancing speaking performance(El Shazly, 2021); by boosting motivation (Yin et al., 2021); and by improving reading comprehension(Bailey et al., 2021). The purpose of using multimedia in the teaching and learning process is to help teachers explain challenging subject. The use of multimedia technologies can increase motivation for learning and make it more interesting (Indrawan et al., 2020). Technology-based learning multimedia is used as a teaching medium, both in class and individually. It can be concluded that the use of multimedia will facilitate students in learning.

Worksheets have been suggested as helpful teaching resources for putting constructivist learning theory principles into practice (Proctor et al., 1997). Worksheets are regarded as essential tools since they describe the next actions for pupils to take and outline the processes of a process. Additionally, they let the whole class to participate in the allotted activity and

assist students in organizing their views about the subject matter (Celikler & Aksan, 2012). Additionally, worksheets provide guidance and opportunity for problem-solving (Kisiel, 2003). Because they will retain material better in their minds and engage more fully in the activities the teacher assigns in class, student worksheets will greatly help kids learn. The concept of student worksheets is strongly tied to the constructivism learning theory, which maintains that students actively participate in their education and that their past knowledge aids them in making sense of the content they are learning or engaged in.

The researcher suggests the electronic worksheet in response to the issues raised in the earlier stage. Artificial Intelligence (AI) voice and Adobe Animate CC were used to create this electronic worksheet. The establishment of artificial intelligence (AI) resources to aid language learning ought to be based on what instructors would do in actual situations of teaching and learning languages.(Sumakul et al., 2022). The digital worksheet is A type of technology-based multimedia is Adobe Animate. To assist teachers in explaining complex material, multimedia is used in the teaching and learning process. Utilizing multimedia tools can boost interest in learning and raise motivation for it (Indrawan et al., 2020). The use of technology in education Multimedia is employed as a teaching tool in both group and individual settings. It can be concluded that the use of multimedia will facilitate students in learning.

## 4.3. The Effectiveness of e-Worksheet

This worksheet is designed by using Technological based that support the connectivism learning theory in this digital era. To fulfill the demands of 21st-century learning, such as the need for instructional materials, practicums, ways to avoid boredom, technology advancements, and the effects of pandemics, it is crucial to build innovative E-LKPD (Suryaningsih & Nurlita, 2021). The inspire of future orientation of integrating the TPACK framework in the English language teaching in 21st century (Par, 2022). In addition, the TPACK model-based active learning programs have the potential to boost students' creativity. The increase in student creativity was similar across Sthe three classes. The learning process can be designed using the guidelines from the TPACK-based active learning(Angraini et al., 2022). Thus, the worksheet is designed based on Technological, Pedagogical and Content Knowledge (TPACK) Model.

## 5. CONCLUSION

The study, which was carried out utilizing the Four-D approach (defining, designing, developing, and disseminating), is divided into four main components that are actually related to the research questions based on the findings and discussion in the previous section. First, based on what was discovered in the first question related to the teacher's problem, the

students' problem, and the instructional problem that both the teacher and the students indicated that most students are still having difficulties in English subject and that there is a need to develop an electronic worksheet that can help students to learn with better comprehension. The worksheet that was intended to be developed is an electronic worksheet that can help students to learn by giving them some various tasks and by providing opportunity to learn independently in the classroom but also outside of the classroom. Thus, the electronic worksheet with the focus of using Technological, Pedagogical, and Content Knowledge (TPACK) Model by using Adobe Animate CC and AI Voice as an effort to fulfil the need.

Second, the researcher designed the prototype the electronic worksheet of instruction that based on Technological, Pedagogical, and Content Knowledge (TPACK) Model in learning English. The researcher formulated stages of designing E-Worksheet into 5 main stages. The worksheet basically starts with an analyzing curriculum conducted in the classroom. needed to find out the sequence of worksheets to be prepared. The sequence of these worksheets will later be used as a guideline for writing so that the contents of the material presented on the worksheet can be arranged by the curriculum analysis that has been carried out. Then, determine the tittle of the worksheet and develop the worksheet frameworks. Third, how to develop the electronic worksheet, the researcher concluded that all the research products, namely; the electronic worksheet and lesson plan fall into the category of valid and practical by using expert appraisal.

Finally, at answering to valid, practical, and effectiveness, the researcher concluded that the instructional material was effective in helping students to learn with better comprehension. The electronic worksheet was proven effective based on the students' post-test scores in the experimental and control class where the experiment class scores better than the control class. It indicated that there is a significant effect of using the electronic worksheet toward the students' English skill.

In this case, the researchers would want to share several of suggestions for additional advancement. E-worksheets can be used in classrooms with diverse learning resources or in schools designed for more students by researchers and educators in the future. In addition, autonomous curriculum developers can modify how e-worksheets and learning are implemented. In order to facilitate the development of e-worksheets and their deployment in classrooms, it is advised that the schools chosen for this study have excellent internet connectivity. The study process and the desired outcomes will be hampered if there are network issues and restricted internet access during implementation. To ensure that the product being produced passes testing and yields meaningful results, researchers undertaking development

research must undertake trials in a broader study field. However, using a different set of materials, trial sample populations, and a comparison class, researchers can create e-worksheets using the same design approach or employ more interactive applications.

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