

# Creating a Desktop-Based Learning Resource with an Educational Game Application for the Introduction to Accounting Course

Kartika Dewi Sri Susilowati\*, Nurafni Eltivia, and Firda Rahmawati

**Abstract**—The objective of this study was to create a desktop-based educational gaming medium for the Introduction to Accounting course in order to improve students' interest in learning the material delivered. Research and development (R&D) was the technique employed, and the stages of the development model began with needs analysis, design, and development. A needs analysis was conducted to determine the needs and traits of the students who will be the target users of this computer game. Interviews and the distribution of questionnaires were used to conduct the analysis. The purpose of the analysis of students was to gather data on what the students need from their accounting classes. The initial design was transformed into a storyboard design during the design stage, and the game was developed in accordance with the design that was made during the development stage. The application system that was developed was then tested and validated. The validation was performed on seven individuals: one lecturer, one IT developer, and five students. The validation results indicated that the product was very feasible with an average validator assessment score of 82.3%. The scores of 75%, 82.7%, and 89.3% assigned by the media expert, material expert, and users, respectively, served as evidence for this. This educational game was created to add variation to teaching methods; however, it is not able to take the place of the lecturer in the process of teaching. Since the development of this instructional game is still in its early stages, additional research can be carried out by adding new materials with a more attractive appearance using added animation or music in the background.

**Index Terms**—Accounting, educational game, game media, learning resources

## I. INTRODUCTION

Coronavirus disease 2019 or the coronavirus outbreak was first discovered in 2019. Due to this virus, human activities around the world have been disrupted and kept from functioning as usual. The sector of education is no exception [1]. The Indonesian government has been employing a variety of strategies to combat the coronavirus due to its rapid development and spread, including issuing the study-from-home policy. Through Circular Letter Number 36962/MPK.A/HK/2020, the Minister of Education and Culture of the Republic of Indonesia urged all university leaders, heads of higher educational institutions, heads of provincial education office, heads of district/city education office, and heads of technical implementation unit to

postpone all activities that would invite large crowds and replace them with teleconferences or other online meetings. Related to this condition, during the COVID-19 outbreak, online learning was selected as the most effective way to prevent the virus from spreading [2]. Online learning is the process of converting traditional education into a digital format [3]. Implementing online learning undoubtedly requires the readiness of many stakeholders, including educators, higher-education-related institutions, and the students themselves. Educators, in this case, should constantly innovate in the use of tools and differentiate techniques of didactic processes.

As the majority of students have never participated in online learning before, in order to boost students' motivation and capacity for learning, educators must be able to understand and apply learning technologies [4]. The effectiveness and quality of the teaching and learning process greatly benefit from the use of learning technologies. Accordingly, learning environments should be adjusted to the existing abilities, requirements, and past knowledge of the current generation in order to be effective since members of this generation approach learning materials in a variety of unique and creative ways. They prefer interactivity, learn more effectively from the video content, can use multiple screens at once, and are active users of social media; as a result, one-way education makes them less interested in the process [5]. According to surveys, two-thirds of students thought that technology could improve their academic performance and better prepare them for a technologically dependent workforce [6, 7]. Universities that do not successfully incorporate technology into the learning process lose opportunities to enhance student outcomes and satisfy the demands of student bodies that have become accustomed to the incorporation of technology into every aspect of life [8–10].

According to Kirkwood and Price [11], the usage of learning-related technologies enables students to comprehend a subject better. Meanwhile, Kirkwood and Price [12] stated that a number of earlier studies have demonstrated that educational games could boost motivation and interest in learning. Additionally, Lauryn and Ibrahim *et al.* [13] stated that educational games could help make the teaching-learning process more enjoyable with a level of creativity in the way the subject is delivered. Therefore, in order to optimize student's learning outcomes, it is crucial for lecturers to comprehend and utilize technologies more [4]. Lecturers as future educators must be able to work as artists and scientists in planning and implementing learning activities and managing learning materials with the goal of

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The authors are with the Accounting Department, State Polytechnic of Malang, Malang, East Java, Indonesia.

\*Correspondence: kartika.dewi@polinema.ac.id (K.D.S.S.)

making it simpler for students to understand the subject matter provided. Information-technology-based learning media have been shown to enhance students' learning outcomes [14, 15]. Similar findings from the research by Seow and Wong (2016) demonstrated that learning materials based on the Android application "Accounting Challenge" could raise students' interest and motivation in studying accounting. Learning media are defined as anything that can transmit information from information sources to information users [16]. The media utilized in learning must be tailored to the learning objectives because the media must play a significant role in fostering the quality of the learning process.

The preliminary study's findings revealed a number of issues with how the Accounting Department at the State Polytechnic of Malang carried out teaching during the pandemic. One of the issues that arose was that the learning process still relied on the use of the lecture method, which made students passive and more likely to act as no other than knowledge retrievers. They became a little bit bored and lost interest because of the monotonous teaching-learning method. It is not surprising because, more often, lecturers monopolized all the time during the lecture, thereby denying students the opportunity to participate in the classroom and allowing little feedback from them for the sake of covering the course contents.

The absence of practical academic teaching resources in the field was identified as an additional issue. The preliminary study's findings, in particular in the Introduction to Accounting course, demonstrated the lack of development of teaching materials. The students were not motivated in the learning process because of their paradigmatic view that the accounting course is hard and difficult. Seow and Wong [17] questioned how lecturers might shift from 'uploading contents' to students to better-teaching methods that encourage students to more actively engage in the teaching and learning process, i.e., the learner-centered approach. The researchers were concerned about these problems, so they made teaching content for the Introduction to Accounting course through a desktop-based educational game. Educational games can be utilized as learning media that can have a good influence and are very effective and efficient to improve students' interest and motivation to learn [18]. Accordingly, the goal of this study was to create a dynamic, imaginative, and effective learning tool in the form of a game as a learning medium, hereinafter called a desktop-based educational game.

## II. METHODOLOGY

The researchers employed the research and development (R&D) method in this study. This study focused on the creation of materials needed to teach an accounting course. The ADD (analysis, design, and development) approach was used in this study since it was designed to help researchers from the very beginning of their work through the product's development [19].

The analysis step was conducted to determine the needs and traits of the students who will be the target users of this computer game. Interviews and the distribution of questionnaires were involved in conducting the analysis. The

purpose of the analysis of students was to gather data on what the students need from their accounting classes. Therefore, the researchers should gather as much information about the students' needs as possible.

The next step was to design. This stage consisted of the product design and the product manufacturing phases. Learning materials were developed and created in the form of an educational game. The information utilized to build the product was collected from a variety of sources, such as journals, books, magazines, etc. The materials used must be relevant to the needs of the students. In this stage, creating a *storyboard* design was the first thing that needed to be done. The term *storyboard* refers to a concise summary that describes the flow of the learning product from the initial description and concept presentation to the assessment. A medium design (*storyboard*), a representation of the overall educational medium to be loaded in the application, was created during the design stage. The *storyboard* acted as a roadmap or guide to speed up the production of the medium.

The next step was to develop the application game (product manufacture). During this phase, all of the game's elements were prepared. The process of creating the gaming application was carried out at this point. After the game application was completely designed, the medium was sent to the stage of product validation and testing. The objective of this stage was to identify and fix the errors that were found in the learning medium that was developed. The preliminary product was validated by a media expert and a material expert. Validation was conducted in order to identify the product's fitness for implementation. Media validation was performed by the media expert—An IT developer—while material validation was performed by a lecturer majoring in accounting subject. The following are the questionnaires used as the instrument for the validation process. Table I is the questionnaire for the media expert, Table II is for the material experts and Table III is for the potential users.

TABLE I: THE QUESTIONNAIRE FOR THE MEDIA EXPERT

No.	Indicators	Items	Source
1	Visual Appearance	The selection background is appropriate with the material.	[20, 21]
		The proportion of the layout is appropriate.	
		The font type is appropriate for easy reading.	
		The font size is appropriate for easy reading.	
		The main menu display is of good quality.	
		The main menu is attractive.	
		The display is appropriate with the content.	
		The game design looks attractive.	
		The use of learning strategies in the game "Guess the Answer: Accounting" is appropriate.	
2.	Software Engineering	The presentation of the learning objectives in the game "Guess the Answer: Accounting" is clear.	
3.	Material	The material in the game "Guess the Answer: Accounting" is well conveyed.	
		The material provided is in accordance with the learning objectives.	
		The use of learning strategies in the game "Guess the Answer:	

4.	Effects on Learning Strategies	Accounting” is appropriate.	
		The game “Guess the Answer: Accounting” is effective for self-study.	
		The game “Guess the Answer: Accounting” is efficient for self-study	
		The submission of the game “Guess the Answer: Accounting” increases the interest of students in learning.	

TABLE II: THE QUESTIONNAIRE FOR THE MATERIAL EXPERT

No.	Indicators	Items	Source
1.	Material	The learning objectives are in accordance with the material presented.	[20, 21]
		The learning objectives are in accordance with the curriculum.	
		The material provided is in accordance with the learning objectives.	
		The game “Guess the Answer: Accounting” is easy to understand.	
		Each level has one definite answer.	
		The material presented in the game “Guess the Answer: Accounting” is important for students.	
		The language used is in accordance with students’ understanding.	
2.	Effects on Learning Strategies	The game “Guess the Answer: Accounting” can be used as a learning medium.	[20]
		The game “Guess the Answer: Accounting” is interactive.	
		The game “Guess the Answer: Accounting” can increase interest in learning.	
		The game “Guess the Answer: Accounting” can increase learning motivation.	
		The game “Guess the Answer: Accounting” is interesting.	
		The game “Guess the Answer: Accounting” makes it easy for students to study the material.	

TABLE III: THE QUESTIONNAIRES FOR POTENTIAL USERS

No.	Indicators	Items	Source
1.	Material	The learning objectives in the game “Guess the Answer: Accounting” is clearly stated.	[20]
		The use of words and sentences is clear.	
		The material presented is appropriate.	
		The material presented is easily understood by students.	
2.	Software Engineering	The game “Guess the Answer: Accounting” does not require a high-specification device to play.	[20]
		The game “Guess the Answer: Accounting” does not require a manual to play.	
		No system disturbances occur when the game	

3.	Visual Appearance	“Guess the Answer: Accounting” is played.	
		The design of the game “Guess the Answer: Accounting” looks attractive.	
4.	Effect of Learning Strategies	The game “Guess the Answer: Accounting” can be used over and over again.	
		The game “Game Guess the Answer: Accounting” is easy for students to use independently.	
		Students’ interest in learning can be increased with the game “Guess the Answer: Accounting”	
		Students’ motivation can be increased with the game “Guess the Answer: Accounting”	
		The game “Guess the Answer: Accounting” is effective in making it easier for students to understand the material in a shorter time.	
The game “Guess the Answer: Accounting” allows for the excitement of a different sort when playing it.			

The following Fig. 1 shows how this study was carried out:



Fig. 1. The stages of the study.

This study employed a desktop program called PyGame to create the game. Python is a programming language that allows for carrying out a variety of multipurpose commands using object-oriented techniques. This game development went through multiple stages, namely, 1) application planning, which involved identifying the target audience and the format of the game application; 2) data collection, which involved gathering images, materials on basic accounting, Python code, and flowchart designs from books, websites, and other sources; 3) application design, which entailed building interfaces, program structures, and logic flow; and 4) implementation, which entailed writing the program code, compiling the program, and verifying the program’s viability.

### III. RESULTS

#### A. Analysis Stage

The analysis stage’s goals were to gather necessary data and determine the intended concept for the game. It started

with an observation of the information required for the creation of the game. There were two topics to be addressed, namely, the learning method, which remained to exclude media that effectively used information technologies, and the lack of interest among students in the subject matter due to the use of outdated media to deliver information and monotonous teaching-learning implementation. Departing from these issues, an IT-based learning game conveying Introduction to Accounting course materials was developed as a learning medium. A puzzle quiz was used in this game since it could sharpen students' focus, deepen their understanding, and enhance their memory. Table IV displays the results of the needs analysis.

TABLE IV: ANALYSIS STAGE

Title	Guess The Answer: Accounting
Target users	Second-semester students majoring in Management Accounting at the State Polytechnic of Malang
Type of game	The game is a hybrid of puzzle quiz and educational game genres.
Scoring system	Each correct answer will receive a score. If an incorrect answer is made, life's hearts will be reduced by one.
Number of game levels	The game has 10 questions ranging across 5 levels.
Platform targets	The end result is a desktop-compatible puzzle quiz game. There is no need for a laborious installation procedure because .exe files are used.

Source: Processed Data

PyGame and Pycharm software was used to develop the game application. PyGame is an open-source package compatible with various systems. A functional Simple DirectMedia Layer (SDL) library was included in PyGame to support game development. Pycharm, on the other hand, is one of the most comprehensive and all-inclusive tools for using the Python programming language. Linux, Mac OS, and Windows platforms are all compatible with Pycharm.

**B. Design Stage**

The educational game "Guess the Answer: Accounting" design was based on the needs analysis findings. Fig. 2 is a flowchart and a storyboard design used to illustrate how this educational game was designed.

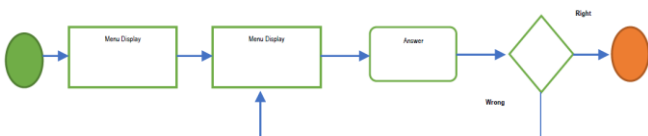


Fig. 2. The flowchart for the educational game.

The following Table V is the storyboard design for the educational game "Guess the Answer: Accounting" which was used to provide an illustration of the interface design before the actual application was developed. The storyboard design consists of the main menu, the "game level" page, the "right answer" feedback page, and the "wrong answer" feedback page.

TABLE V: THE STORYBOARD DESIGN

No	Name	Design	Description
1	Main Menu Layout		- Logo game - "Play", "Help" and "Exit" buttons
2	Levels Layout		- Level 1 up to level 5: topics in inventory
3	Initial Game Layout		- Each level layout - There are 5 chances to answer - Timer
4	Bonus Chapter Layout		Matters of Calculation

Source: Processed data

**C. Development Stage**

At this stage, the storyboard design was used to actually create the educational game. The game development comprised multiple steps.

**1) Designing the interface**

The interface design was created in accordance with the storyboard design. The basic Canva application, which is frequently used to create 2D items for video games, was utilized in this step. The interface design for the educational game "Guess the Answer: Accounting" is shown below:

**a) Main menu**

Below Fig. 3 is the main menu that is shown at the beginning of the game. The "Play" button starts the game, the "Help" button provides an introductory tip, and the "Exit" button ends the game. These buttons make up the main menu.



Fig. 3. The main menu.

b) The game's opening view

When the user starts the game, the layout below will be displayed. There are four columns in this layout: The first column displays the score, the second column shows the level, the third column shows questions and hints, and the fourth column is where the user enters answers. If the user responds properly, they can move on to the next question; if they respond incorrectly, their "heart" will be reduced by one.

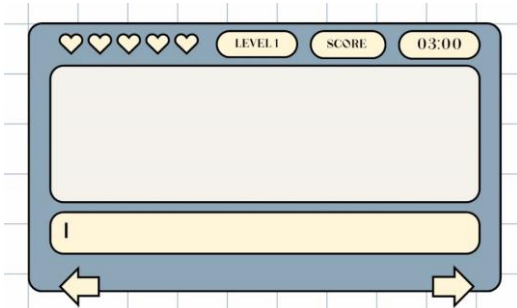


Fig. 4. The game's opening view.

c) The display for "right answer" feedback

When the user successfully completes the questions, feedback is displayed in this layout. If the user responds properly, this feedback will automatically appear, and they will move on to the following question or level. Fig. 5 shows the layout.



Fig. 5. The display for "Right Answer" feedback.

d) The display for "wrong answer" feedback

Feedback is shown in this layout when the user does not correctly respond to the questions. As shown in Fig. 5, there are three hearts, or three chances to respond to each question. If the user chooses a wrong response just once, their heart rate will decrease, and if they continue to choose incorrectly up to three times, this feedback will appear. Fig. 6 shows how the design is executed.



Fig. 6. The display for "Wrong Answer" feedback.

D. Validation Results

The application system developed was tested and validated.

This phase was completed to ascertain whether or not accounting students will be able to use this application. Application validation was performed by seven individuals, namely, one lecturer, one IT developer, and five students. The outcomes of user validation, material validation, and media validation are listed below.

1) Results of media expert and material expert validation

From the validation tests involving two validators, a media expert and a material expert, it was revealed that the game obtained a very high value for each validation criterion. As can be seen from Table VI below, the media expert gave a total score of 54 out of an ideal score of 72 from 18 items, resulting in a percentage of 75%, with a very feasible criterion. Meanwhile, the material expert gave a total score of 43 out of an ideal score of 52 from 13 items, resulting in a percentage of 82.7%, with a very feasible criterion.

TABLE VI: RESULTS OF MEDIA EXPERT AND MATERIAL EXPERT VALIDATION

No	Expert	Items	Ideal Score	Total Score	Percentage	Criterion
1	Media	18	72	54	75.0%	Very Feasible
2	Material	13	52	43	82.7 %	Very Feasible

Source: Processed Data

2) Results of user validation

In order to establish whether the instructional game "Guess the Answer: Accounting" was practicable or not and to gather suggestions or comments for game improvement, five accounting students were asked to take the user validation test. Table VII below was the results of the user validation.

TABLE VII: USER VALIDATION RESULTS

No	Number of Respondents	Items	Ideal Score	Total Score	Percentage	Criterion
1	5	14	280	250	89.3%	Very Feasible

Source: Processed Data

Based on the results of user validation, the game had a very high feasibility criterion with a total score of 256 out of an ideal score of 280 from 14 items, resulting in a percentage of 89.3%. Some commentaries suggested that the game was able to provide students with benefits in learning accounting, particularly on the subject of inventory, and attract and increase their motivation in learning an Accounting subject.

IV. CONCLUSIONS

The desktop-based educational game "Guess the Answer: Accounting" was designed for second-semester accounting students at the State Polytechnic of Malang who are taking the Introduction to Accounting course. The development of the game followed the stages of needs analysis, software analysis, educational game design, and educational game creation. The game was created using Pygame software for programming and Pycharm for game application creation.

The validation results indicated that the instructional game "Guess the Answer: Accounting" is very feasible. This is based on the average score of 82.3% obtained, which was



calculated from a score of 75% from media expert validation, 82.7% from material expert validation, and 89.3% from user validation. The desktop-based educational game “Guess the Answer: Accounting” is especially well-suited to the Introduction to Accounting course because of its potential and usefulness as a teaching tool for teaching the Introduction to Accounting course. However, in order to accelerate and improve the teaching and learning process, lecturers must still use supplementary media. In this case, lecturers need to be creative in order to make this online learning environment exciting and effective by developing their own unique teaching concepts and learning methodologies.

Since this educational game is still in the early stages of development, further research can be carried out involving new materials with a more attractive appearance from added animation or music in the background so that students are motivated to learn and do not feel bored.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Each researcher offered a significant contribution. In brief, the assignment of responsibilities is as follows: Kartika and Frida conducted the research, Nurafni, and Frida analyzed data, Kartika and Frida prepared the research report, and Kartika, Nurafni, and Frida collaborated for journal publication. All of the researchers have authorized the most recent version of this work.

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