

MOBILE GAME-BASED LEARNING WITH GAMEMAKER STUDIO

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Abstract

In tapping the thriving mobile business, a study on mobile content development, specifically API is urgently required. Highly wanted API is indeed for education, entertainment and games that can be downloaded on Play Store. Thus, we develop a mobile game-based learning about multicultural learning. It was technically tested for its functionality, compliance, compatibility and soaking. Furthermore, to assess the insights of potential players, informal interviews and observations were conducted. In addition to that, the multicultural game characters and the game plan developed for the game were tested for their appealing merit. Overall, responses were remarkably consistent. Participants overwhelmingly considered the game as interesting and really attractive, successful in delivering the intended learning content, easy to play and simple to use. Findings also stressed two important points (1) multicultural, appealing and well-developed characters are important elements to ensure better learning experience and (2) multicultural uniqueness must always be incorporated to ensure better learning motivation and increase mobile acceptance. .

Keywords: mobile game, GameMaker Studio, API, game-based learning

I. INTRODUCTION

In the world of games, there are various types of games that can be played. Various types of games according to platforms based on industry trends in 2019 [1], namely PC games, console games, mobile games, and online games. Educational games can be used to assist the learning process. Training in various subjects, using the game is not boring for students. This game is equipped with tutorial, practice and exam functions. Every game developer wants to upload the games to Play Store and sell it.

Even though the developers can now make cross-platform apps and games, they need to know how to release them on platform-specific stores. The Google Play Store is the largest marketplace for apps targeted at Android users and it has a couple of rules that you'll need to follow in order to successfully publish your app or game. If they want to find out how to publish an app to the Play Store, follow this guide and complete the checklist [2].

This paper is a description how to develop a

mobile application with the APK format to suit the requirement Google Play Store, especially about API.

1.1 Game MakerStudio

GameMaker Studio entered beta in March 2012 and full release in May 2012. Supported platforms include Windows, Mac, HTML5, Android, and iOS. In February 2015, GameMaker was acquired by Playtech along with YoYo Games. It accommodated the creation of cross-platform and multi-genre video games using a drag-and-drop visual programming language to develop games using only the drag and drop feature. Besides, game development can use the GameMaker Language scripting language. The scripting language was designed for novice programmers to create computer games using actions without much programming.

The developer intended GameMaker for creating games with 2D graphics, which use the standard library for graphic drawing and 2D primitives. [3]

II. REVIEW OF MOBILE GAMES

2.1 The History

Mark Overmars developed GameMaker, and released this program was first released on November 15, 1999, under the name Animo, as a graphical tool with limited visual scripting capabilities (Ford, 2009). In the next release, Animo's name changed to Game Maker as software that led to the development of 2D games. Versions 5.0 and below are freeware, while version 5.1 was released with an optional registration fee, and version 5.3 was introduced with several new features for registered users. Version 6.0 has limited functionality for use in 3D graphics and runtime migration from VCL to DirectX.

Growing public interest prompted Overmars to seek help to expand the program, which led to a partnership with YoYo Games in 2007 [4]. Further development was handled by YoYo Games, while Overmars retained his position as one of the company's directors. Version 7.0 was the first to appear under this partnership, was compatible with macOS released in 2009, and was published in two operating systems.

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2.2 Game Basic Criteria

In order to judge whether or not a game is included, the basic criteria of a game can be used to differentiate it. This criterion applies not only to "rule game", but to all games. Here are the criteria shared by all games.

- general experience. Games bring people together regardless of gender, generation, and race. Most of the games are multiplayer games which lead to a group experience and take a long time to end the game. However, there are groups of games that are played alone, such as solitaire games and most computer games.
- equality. In a game, all players have an equal chance of winning, which is absolute equality. One of the reasons why children like to play games because in the game they are equivalent to adults.

- freedom. Whoever plays the game does so based on his freedom of choice. He was not forced by anyone to play. Playing games is not a job, not a commitment, and there is no obligation to do it.
- activity. Anyone who reads a book, watches a movie, or listens to music gets something but does not act. While most games get people to take action.
- dive into the game world. Whoever plays the game can enter the game world environment.

2.3 Kinds of Games

In the world of games, there are various types of games that can be played. Various types of games according to platforms based on industry trends in 2019 (WePC. 2019), namely PC games, console games, mobile games, and online games.

- PC Game. A personal computer game (PC game) is a video game that is run on a computer. This game is controlled using input equipment such as a keyboard, mouse, joystick, and others. PC games can be played with or without being connected to the Internet. This type of game is usually played using a personal computer or laptop. A large number of games are available for the PC platform, as Figure 1.1.
- Console Game. Console games are an inactive form of multimedia for entertainment, consisting of manipulated images (and usually sound) that are formed by a console and displayed on a television or audio-video system. The game is controlled and manipulated by players using tools that can be held and connected to a console called a controller.
- Mobile Games. A mobile game is a video game that runs on a mobile device, smartphone, PDA, tablet computer, portable media player, or calculator. This does not include games that run on dedicated handheld video game systems.
- Online Game. An online game is a video game that is partly or wholly executed via the Internet or other available computer network. Many online games are developed by online communities, while social games are integrated between players and communities that exist in the world.

III. USER EXPERIENCE OF ANDROID

Google Play and Apple App Store are by far the two largest platforms for distributing and promoting apps. It doesn't matter whether you develop your app yourself, order it from a professional developer, or build it using a codeless tool, the process of publishing an app to the store is the same for everyone and it's important to comply with some requirements for you. application to successfully pass moderation and be published.

To avoid problems and possible refusal to publish your app, we have compiled a list of requirements that must be met for the app to be published successfully to the respective stores.

3.1 Application Programming Interface

API is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other. Each time you use an app like Facebook, send an instant message, or check the weather on your phone, you're using an API [5]

Every new Android version introduces changes that bring security and performance improvements as well as enhance the user experience of Android overall. Each app has a target SDK Version in the manifest file (also known as the target API level) which informs how your app is run on different Android versions. Configuring your app to target a recent API level ensures that users benefit from security, privacy, and performance improvements, while still allowing your app to run on older Android versions (down to the min SDK Version). [6]

3.2 File format

Upload your app files in APK (.apk) or ABB (.abb) format. This is required to run your app on Android devices. Starting August 2021, Google is starting to switch to ABB, as the format is 15% smaller and can be downloaded faster. ABB will soon become the main format and completely replace APK. [7]

3.3 Reason for rejection by Google Play

- Restricted content. Your app will not be approved if it contains inappropriate content related to violence, bullying, harassment, illegal activity and explicit hate that has the

potential to harm children or threaten general users.

- Stolen Intellectual Property. Your application will be deleted if you refer to or copy any brand that is not yours.
- Security and privacy issues. Google is committed to protecting user privacy. If deceptive, malicious or intentional misuse of user personal data is detected - your application will be strictly prohibited.
- The Children's Online Privacy Protection Act (COPPA) is not complied.
- Billing Guidelines are not followed. Once you've included monetization in your app, be sure to state all charges in the description.
- Ads do not comply with all Google policies.
- Functionality is broken. Low quality apps with lots of crashes and freezes are banned from Play Store.

IV. DESIGNING GAMES FOR PUBLICATION

4.1 Publish on Android Platform

This manual section covers the different platform-specific Preferences that need to be set up before compiling your games to certain targets. These generally only need set up once to start with certain things. After that, these will be used to point to any SDKs required and set Compiling basic options for how you want GameMaker Studio 2 to compile your game projects for any given platform. Note that the platforms available will depend on your license, and not all of them may be available.

Setup GameMaker Studio for Android Platform The first part of the general section informs about the product: information and the Build Settings. First, you should fill in the Product information, which includes the project's Display Name. Its Package information, which consists of a Domain, Company, and Product. The package information can only be made up of letters from A-Z and numbers 0-9, with no symbols or other special characters, nor should it have uppercase characters. These details are used to generate a Package ID with the format "com.company.myappname".

The Build Tools (and Support Library if required) are used when GameMaker Studio 2 builds the game for Android target and should be set to appropriate values based on the tools

you have installed using Android Studio [8], as shown in Figure 1:

- **Target SDK.** The Target SDK indicates that you have tested your app on (up to and including) the version you specify here. This gives the Android OS an idea of how it should handle your app in terms of OS features. Most apps will want to set Target SDK to the latest released version of the API (as used by the Compile SDK setting). This will ensure your app looks as good as possible on the most recent Android devices. Starting November 2021, mandatory app updates target API level 30 or higher and make adjustments to behavior changes in Android 11. Current apps that don't receive updates will not be affected and can be downloaded from the Play Store. Wear OS apps must continue to target API level 28 or higher. (Lam, 2021)
- **Minimum SDK.** The Minimum SDK version is the minimum API level that will run your project. For example, the minimum SDK version is 16 for API 28+ and anything built for Android YYC. (Be aware Google Play requires you to use API 30 or above when submitting!)
- **Compile SDK.** The Compile SDK version is the version of the API that the project is compiled against. This means you can use Android API features included in that version of the API. For example, if you try and

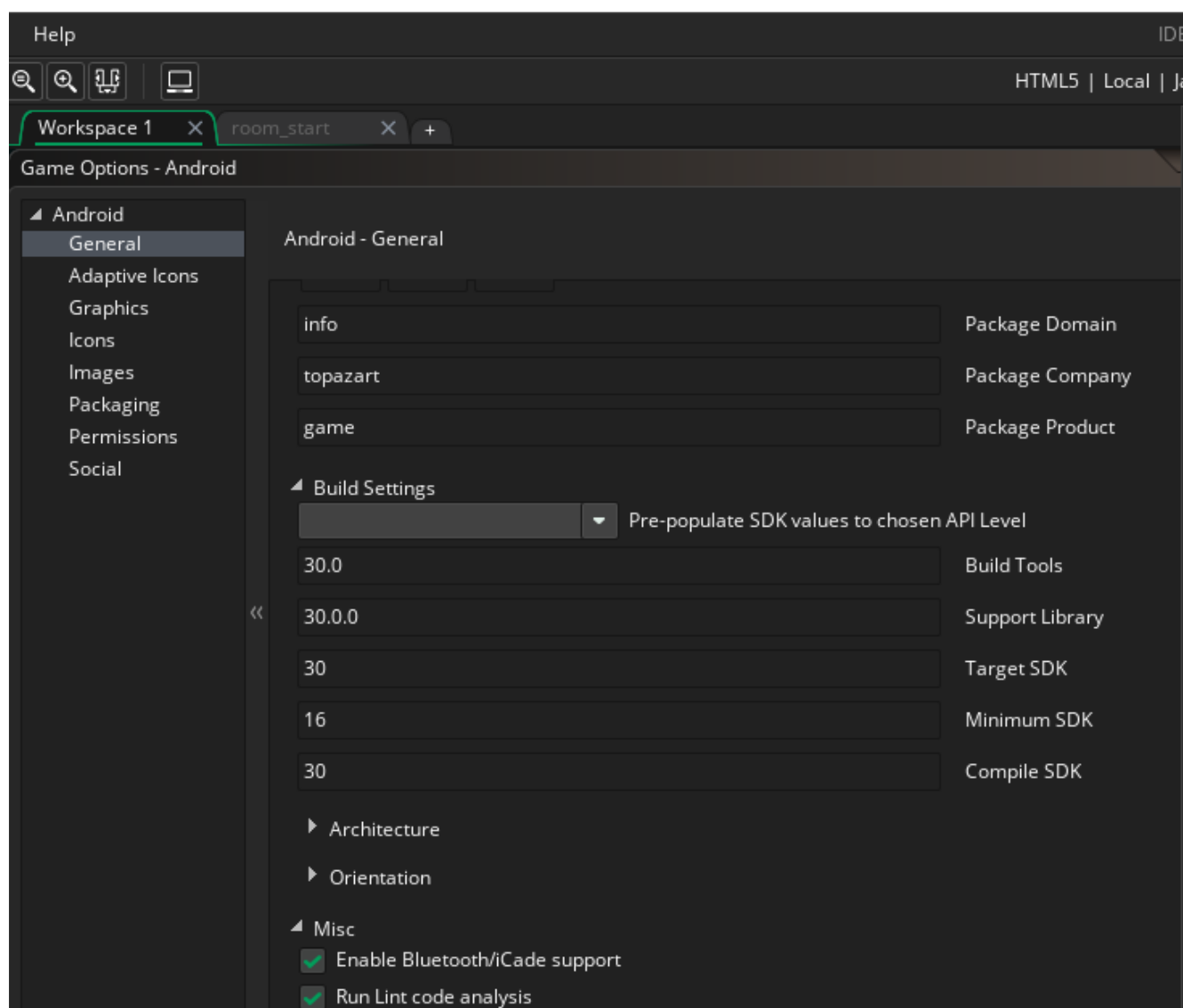


Figure 1. Target SDK and minimum SDK in GameMaker Studio

use API 16 features - for example - but set Compile SDK 15, you will get a compilation error. However, if you set the Compile SDK to 28, you can still run the app on an API 26 device (as well as all other previous versions).

4.2 Game design and development

Mobile game development is more difficult than desktop application development. Its challenges are smaller screen size, low colour depth, limited memory, limited processor, limited file size, short battery life, few input style options and different fragmentation. Due to these, literatures suggest for casual game, game plan should be simple and addictive over graphics game, and also uses simple user controls [5][9]. Furthermore, researchers compared two most popular platforms used for mobile game development, Adobe Animate and GameMaker Studio as shown in Figure 2.

GameMaker Studio	Adobe Animate
Complex	Less complex
Powerful	Powerful
2D games	2D games
Multiplatform	Multiplatform
- Android	- Android
- iOS	- iOS
- Window	- Window
- HTML5	

Figure2. A comparison between Adobe Animate and GameMaker Studio

V. CONCLUSION

Mobile game was technically tested for these dimensions: functionality, compliance, compatibility and soaking. Furthermore, in order to assess the insights of potential players, informal interviews and observations were conducted. In addition to that, the local game characters and the game play developed for the mobile game were tested for their appealing merit. Overall, responses were remarkably consistent. Participants overwhelmingly considered mobile game as interesting and really attractive, successful in delivering the intended learning content, easy to play and simple to use. The majority also said that

they would play and buy similar game content in the future. Furthermore, two important points to stress here are that multi-culture, appealing and well-developed characters are important elements to ensure better learning experience for children, youth as well as adults, and multicultural uniqueness must always be incorporated to ensure better learning gains and increase the game acceptance.

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