

Development of Mobile Learning Media Based on Articulate Storyline 3 to Support Independence Learning of Vocational High School Students in the New Normal Era

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ABSTRACT

This research and development aim to develop mobile learning media by using a software called Articulate Storyline 3 which is innovative, effective and attractive, so it is suitable for use. This research and development (R&D) use research steps by Borg & Gall which are combined into nine research steps as needed. The first product developed was validated by two validators, namely material experts and media experts. To assess the effectiveness and attractiveness of the product, it is carried out by media users. Data analysis was calculated using the percentage descriptive formula. Assessment by material experts obtained 93.33%, while media experts obtained an assessment of 98.82%, and the average percentage of media users' questionnaires was 92.5%. Based on the results of this analysis, the media produced shows the criteria of "very feasible" and can be used in field trials with a larger scope to determine the learning independence of students in the New Normal era during the pandemic era in online learning. Student learning independence using a media called O2L APP is stated in the very high category at 82.2%. Therefore, it can be concluded that O2L APP is a very feasible, effective, interactive, innovative and interesting learning medium for General Administration subjects in the New Normal Era.

Keywords: Learning Media, Mobile Learning, Articulate Storyline 3, Independence Learning.

1. INTRODUCTION

Technological developments in the all-digital era have a significant impact on global transitions, resulting in changes in lifestyle in humans [1]. One of the technologies that have the impact of these changes also occurs in the world of education and learning. Technology in education will facilitate the real practice of learning following the times [[2], [3]]. One part of educational technology or learning technology is software or hardware-based learning media that are developed to achieve effectiveness in carrying out learning activities that facilitate the delivery of material to students [[4], [5], [6], [7], [8]]. In addition, learning media will facilitate students' understanding with attractive, dense, and clear visualizations [[9], [10]]. Remembering that the millennial generation who are born are surrounded by various technologies and are fluent in their use, it would be nice if the use of this technology was used as a learning medium for students. This is also an implementation of 21st-century learning, one of them is that students are required to master digital literacy skills [11]. This

capability can be achieved by utilizing one of the learning technologies, namely mobile learning, which is a learning tool or media that can be implemented in situations regardless of time and space, only by using a user's smartphone, so that it can become a strong foundation for the learning revolution according to the times. [[12], [10], [8], [13]]. Mobile learning can be developed and operated on an android platform which is open to anyone to develop it which can be utilized by other users. This creates an opportunity for teachers to create creativity in producing a learning product. However, making this learning media is a challenge for teachers considering the ongoing conditions in Indonesia, namely the Covid-19 pandemic

The government is still working to prevent the spread of the virus that causes the pandemic, one of them is by imposing restrictions on social activities or social distancing which causes learning activities not to be carried out in schools or known as Study From Home (SFH). However, recently the government has been aggressively implementing the

new normal policy. The new normal in the field of education is how formal education such as school continues to carry out its functions even in different situations and circumstances. This makes it a challenge for educators to continue carrying out their duties even though they cannot meet face-to-face with students. One way is to take advantage of current technological developments to carry out the distance learning process in the current new normal. Vocational High School Muhammadiyah 7 Gondanglegi Malang Regency applies online learning (in the network) during the current pandemic. Through the observations of researchers at Vocational High School Muhammadiyah 7 Gondanglegi Malang Regency, the learning media used are still normal as in general, namely using PowerPoint slides containing short material on Google Classroom. Based on interviews with several General Administration subject teachers, it was found that during online learning through Google Classroom as a learning process there were still some students who were less active in participating, lacking discipline and responsibility in participating in the learning process such as being absent on time and late in collecting assignments. The characteristics of these students still do not meet the aspects of independent learning as delivered [[14], [15], [16], [17], [18], [19]] that what is an indicator of independent learning is not always expecting help from others, having a sense of confidence in one's abilities, always being disciplined, aware of their responsibilities, acting according to encouragement from within oneself, and being able to control themselves.

Based on this description, the learning media that was deemed suitable as an alternative in implementing online learning during the New Normal period was mobile learning [[20], [21], [22]]. Learning by utilizing mobile learning technology allows users to access material, learning directions even in different conditions by not carrying out learning activities in class. This is because mobile learning can be accessed

2. METHODS

The mobile learning media developed in the General Administration subject in the new normal era is called Research & Development (R&D) which was delivered by Borg & Gall, but has been modified according to needs. [42]. [42] Outlines ten general steps in his research, but the researcher only went through nine steps due to limited time and energy. These simplifications include (1) collecting information and problems in the field, (2) looking for references for the research foundation, (3) developing the initial format of the mobile learning media, (4)

anytime, anywhere, and is flexible by using a smartphone [[23], [24], [25], [26], [21], [27]].

Before the Covid-19 pandemic, mobile learning had been developed for various learning materials in the fields of general administration, correspondence, economics, taxation, geography, and religion. [[28], [29], [30], [31], [26]]. Therefore, researchers developed mobile learning media that can be used as an android application and made using the Articulate Storyline 3 software on General Administration subjects that have been declared appropriate by the validator, as well as effective and attractive for student learning independence so that they can provide learning innovation as a learning tool in schools, homes, and places of study.

Previous research on the development of mobile learning media has been carried out using various applications, including Adobe Flash [32], *Appy Pie* [33], [7], *MIT App Inventor* [34], *Macromedia Flash Animate CC* [35], *Adobe Air for Android* [36], *Android Studio* [9], and *ISpring Suite* [28]. Many previous researchers have also developed learning media using Articulate Storyline software, but it can only be operated on a computer / laptop [[30], [37], [38], [39], [40], [41]].

Novelty from the media in the form of mobile learning is: (1) The android application developed with Articulate Storyline 3 can be operated on a smartphone, and the material presented is more contextual with images, animations, and links that are integrated with YouTube videos.; (2) Proper, effective, interactive, innovative and interesting media can be used for blended learning; (3) The media developed contains three aspects of assessment, namely cognitive, psychomotor and affective assessments; (4) There is a report feature or report to the teacher whose system links with the teacher's *What App*

assessing the feasibility of the media by material and media experts, (5) revising the initial product, (6)) product trials to media users, (7) product revisions, (8) product trials on a larger scale, (9) final product revisions.

The media developed will be assessed for its feasibility by educational technology lecturers as media experts, and productive subject teachers as material experts. The results of the validation will be used to revise the media so that it becomes even better.

Small-scale field trials were carried out on media users, consists 15 students of class X OTKP 1 to assess the effectiveness and attractiveness of the media. Meanwhile, field trials on a larger scale were carried out on 40 students of class X OTKP 2 to determine their independent learning after using the media.

Data in the form of scores from questionnaires, namely quantitative data and data in the form of written opinions, namely qualitative data, will be obtained in

this study. The score is obtained from the results of validation questionnaires or assessments by two experts, media user trials by 15 students, and 40 independent learning questionnaires. The questionnaire is arranged based on a Likert scale to find out a person's assessment of a certain thing [43].

In the table below, an indicator description is presented in the form of an assessment aspect by a material expert validator

Table 1 The Material Expert Instrument Grid

Indicator	Question Number
Relevance Aspects	
Learning text according to the latest provisions	1
The competencies to be achieved are following the content of the material	2
The material is relevant to the objectives and learning competencies	3
The material is relevant to the learning indicators	4
Presentation of Material	
The material is clearly described	5
Examples are presented according to the material and in order	6
Pictures and illustrations to make it easier to understand the material	7
Suitability Problem	
Questions on gamified quizzes, graded questions and practice exercises following basic competency and learning objectives	8
Instructions on practice questions are clearly outlined so that they are easy to understand	9
Multiple choice questions served varied	10
Aspects of Language	
Language is easy to understand according to the ability level of students	11
Use of polite language and according to the values of educational teachings	12
Feedback (feedback)	
Media can encourage student interaction with learning resources	13
Easy to use in the learning process independently or in groups	14
Can encourage interaction between students	15

Source: Akbar (2016) as modified by researchers

Meanwhile, the indicators for the assessment that will be carried out by media experts are described in table 2 below.

Table 2 Grid of Media Expert Questionnaire Instruments

Assessment Indicators	Question Number
Presentation of Media	
Selection of appropriate and harmonious background	1
Selection of matching colours	2
Selection of the appropriate font type	3
Videos, pictures, and animations according to the material	4
The language and sentences used are according to the student's abilities	5
Instructions for use are easy to understand	6
Software Engineering Aspects	
Creativity and innovation	7
Ease of media operation	8

Table cont...

Easy install media	9
Functions and buttons are attractive and easy to use	10
Can be used offline and online	11
Video links are well integrated on YouTube	12
Effectiveness	
Make it easy for students to learn	13
Support learning independence	14
Provide positive benefits according to student needs	15
Exercises	
Game-based quizzes are easy to run and packaged attractively	16
Multiple choice questions and practice questions are easy to run and packaged in an attractive manner	17

Source: Akbar (2016) as modified by researchers

Grating these instruments given to the media, the students of class X OTKP 1 by the table below.

Table 3 Grid of Media User Questionnaires

Indicator	Question Number
Presentation of Material	
Clarity of material content	1
The material is presented sequentially	2
The material is described in easy to understand language	3
Presentation of Media	
Ease of media operation	4
Easy install media	5
Ease of functions and buttons	6
Clarity of images and illustrations	7
Video links work fine	8
Writing/text is easy to read	9
The media is presented attractively	10
Suitability Questions	
The working instructions are clearly described	11
Problems in the media make it easier for users to understand	12
The questions are following the material and learning objectives	13
Feedback (feedback)	
Can improve user understanding	14
Can encourage user learning independence	15
Facilitate the learning process	16

Source: Akbar (2016) as modified by researchers

The feasibility of using mobile learning media based on Articulate Storyline 3 is calculated using a descriptive formula based on the criteria for achieving the value (effectiveness) that was presented [44].

Furthermore, the following instrument grid for assessing learning independence was used by researchers in the field implementation test step.

Table 4 Grid of Student Learning Independence Questionnaire Instruments

Aspect	Question Number
Independent Aspects	
towards other people	1-3

Table cont...

Able to complete tasks independently	
Responsibility Aspects	4-6
Do a good job	
Initiative Aspects	7-9
Doing business on your own	
Discipline Aspects	10-12
Cultivate obedience to certain rules	
Aspects of Confidence	13-15
Confident in achieving the desired achievement	
Self-Control Aspects	16-18
Active in participating in learning	
Self-Evaluation Aspects	19-21

Source: Saefullah et al (2013) modified by researchers

The value of the percentage of learning independence after being calculated will be known

according to the level of the learning independence category in the following table.

Table 5 Categories of Student Learning Independence Questionnaire Results

No	Percentage	Category
1.	81,00% - 100%	Very High / Very Independent
2.	61,00% - 80,00%	High / Independent
3.	41,01% - 60,00%	Enough / Self Sufficient
4.	21,00% - 40,00%	Less / less independent
5.	00,00% - 20,00%	Low / Not Independent

Source: Laksana & Hadijah (2019) modified by researchers

3. RESULTS AND ANALYSIS

3.1 Mobile Learning Media Based on Articulate Storyline 3 in General Administration Subject

The results of the product developed in html5 format are modified into an android application using another software called Website 2 Apk Builder Pro. Articulate Storyline 3 is a software that is easy to use because it has various templates for creating interactive media, especially question exercises and has complete navigation such as the back, next, submit buttons, enlarge images, trigger functions, and has a timeline for the project being worked on. [45].

O2L APP (Organizing Office Layout Application) is an innovative learning media, different from the previous Articulate Storyline-based learning media development research which can only be run on a computer or laptop device. The O2L APP can be run on the user's smartphone by teachers and students, so that they can study material in contextual media (with images, animations, and links that are integrated with YouTube videos) [[46], [47], [48]] to flexible offline and online learning evaluations. Of the accompanying

figure, the "Home" menu in the O2L APP is displayed, which includes six primary menus.

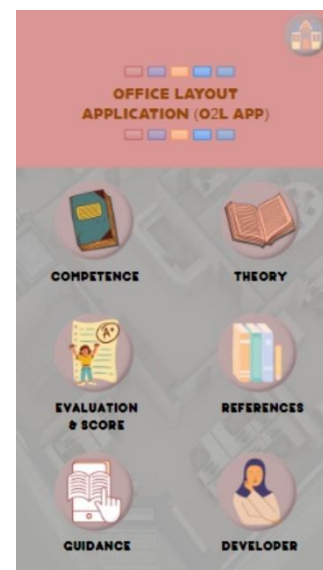


Figure 1 The "Home" menu in the O2L APP

Based on previous research by [28] In the same subject, namely General Administration, only contains learning evaluation in the form of assessment of cognitive aspects in the form of multiple choices. However, the O2L APP developed by researchers includes all aspects of assessment including cognitive aspects in the form of multiple-choice questions on the graded question and gamified quiz features, psychomotor aspects in the form of practice questions on the practice exercise feature, and assessment of the independent learning aspects which can be found in the reflection feature. . The aspect of assessment in the O2L APP makes it easier for students to know their learning outcomes after going through the learning process independently [[49], [50], [51]]. In figure 2, the evaluation menu is presented below.

3.2 Mobile Learning Media Based on Articulate Storyline 3 on General Administration Subjects that Feasible and Effective

The material presented in this O2L APP was validated by material experts. Based on the results of the percentage calculation, the quantitative data obtained is 93.33% with very valid or very feasible criteria. Other data in the form of opinions, suggestions, and written comments, namely: (1) The features in the application are attractive, such as colours, images, and animations that are presented attractively so that it arouses students' curiosity to operate the media further. (2) Questions practice exercise in the evaluation menu is still not inspiring students' ability to analyze a problem further. Data from the results of validation by material experts are presented in Figure 1 below. Based on this data, O2L APP is very suitable for use in terms of the suitability and completeness of the material, as well as the content that supports the presentation of the material to be attractive.



Figure 2 Evaluation menu

The results of working on questions on the evaluation menu can be confirmed directly through the "Report" feature which is integrated directly with the teacher's WhatsApp, making it easier for teachers to collect student work results. This report to teacher feature is not found in applications using the same software and is done by [28] on the correspondence subject for Vocational High School. This is because the O2L APP was developed to maintain interaction between teachers and students even though learning is carried out networking or online [[52],[53], [54]].

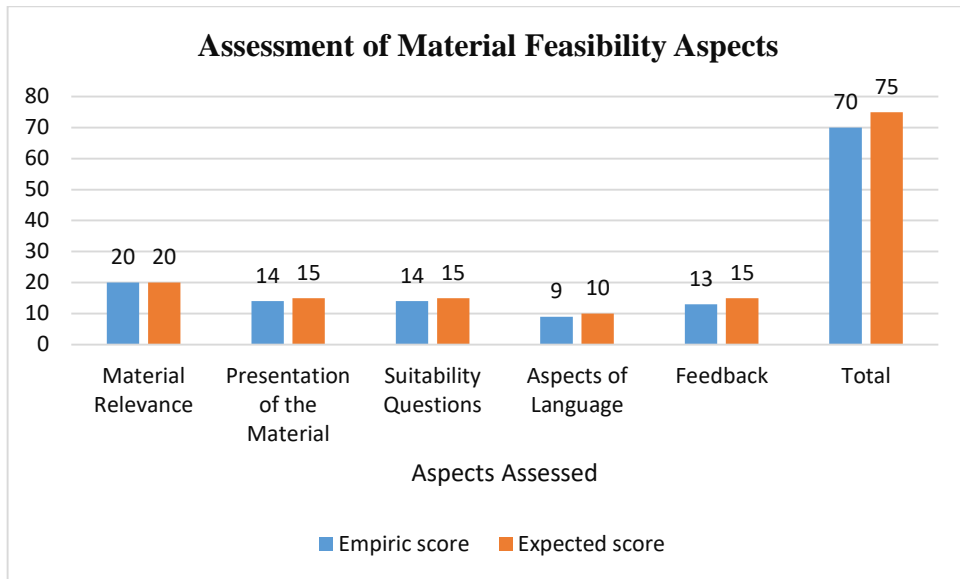


Figure 3 Material Expert Assessment

Validation regarding the material in O2L APP obtained quantitative data in the very valid category of 98.82%. While the qualitative data obtained are: (1) in general the media developed is quite good, (2) it is necessary to optimize the complete list of sources in each image presented and it is necessary to add an introduction or preface that this O2L APP can be used for the online learning process or offline in the New

Normal era, (3) this media is potentially linked with LMS or school institutions that facilitate communication between participants, (4) the media developed is feasible to be implemented at a later stage appropriate with the development design. The quantitative data by the media validator's assessment has been presented in Figure 2 below.

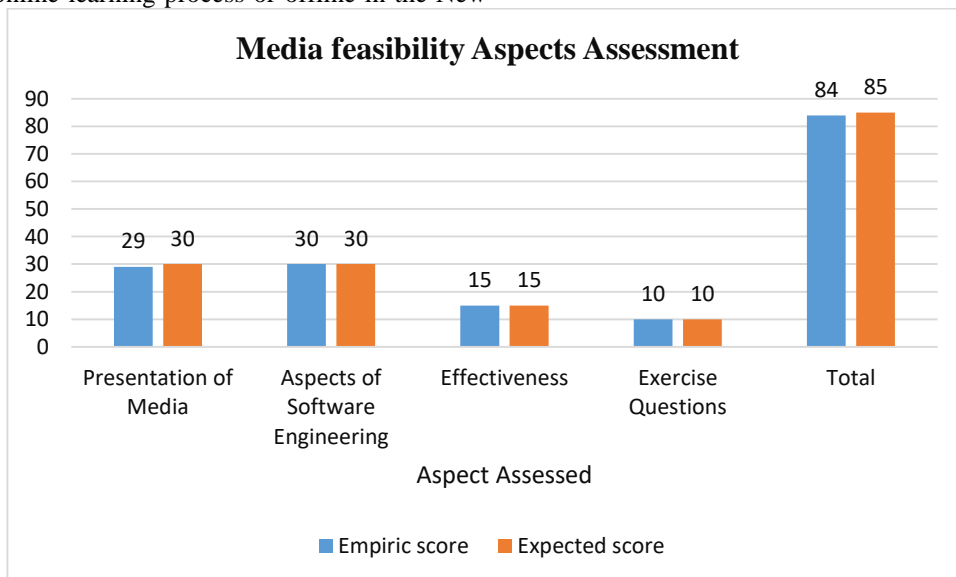


Figure 4 Media Expert Assessment

Qualitative data from expert validation, which is then used as a reference for revision of product development and followed by trials with media users to determine the effectiveness of product usage and attractiveness.

The results of filling out the questionnaire in the form of quantitative data on fifteen media users can

be seen in Figure 3. Based on the results of the percentage calculation, the quantitative data obtained from the results of filling out the questionnaire of media users by a small group of 92.5% with very effective and attractive criteria.

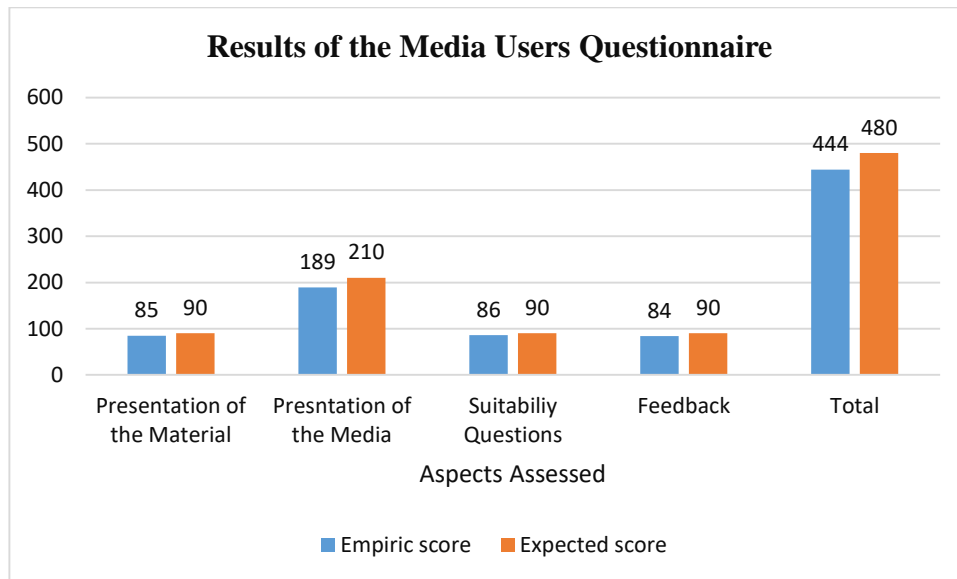


Figure 5 Results of the Media User Questionnaire

The average percentage of the validation as a whole is 94.88% which is presented in Table 6. Overall, the results show that O2L APP is declared very feasible, effective, attractive, interactive and innovative which is assessed from the display of material that facilitates user understanding, the combination of colours and icons. In the application, the completeness of the content in the application, as

Table 6 Overall validation results

Validation	Percentage	Description
Material Expert	93.33%	Very Valid
Media Expert	98.82%	Very Valid
Media Users	92.5%	Very Effective and attractive
Average	94.88%	Very Valid

The table used with permission @Ulumiyah, Ainun. 2021. Overall validation data

The developed mobile learning media has several advantages. The advantages of this O2L APP are (1) it can be run offline or online [[26], [56]]; (2) O2L APP can be a choice during online learning so that students can easily understand the material that is packaged practically even without the presence of the

well as features that support teacher-student interactions. Several previous studies have also shown the results that the learning media that have been developed have gone through the stages of expert assessment and the products have also been tested to assess the feasibility of learning media. [[41], [55], [33], [30]].

teacher and friends in class, this is in line with [20] which states that mobile learning can provide convenience during online or online mixed learning during a pandemic; (3) O2L APP facilitates the transfer of material by teachers to students in the form of applications for student learning independence; (4)

Assessment of affective (independent learning), cognitive, and psychomotor aspects contained in this O2L APP can also encourage students to evaluate their learning process independently. This will motivate students to master competencies in the aspects of knowledge, skills, and attitudes to solve a problem [[57], [58]], (5) The O2L APP file size can be said to be very small, which is 8 MB, so it is easy to install and operate.

In addition, has advantages in O2L APP, this medium also has several lacks, it cannot run perfectly on android smartphones version 5.0 Lollipop and version below, and will run a little slower if the RAM on smartphone users that was small, the value of workmanship evaluation questions It must be screened before sending it to the teacher, there are still some features that require users to use the internet network.

The novelty of the results of this study produces a viable, effective, interactive, innovative

and interesting media that can be used for the blended learning model. This is appropriate with the assessment of validators and media users that the O2L APP contains contextual material that is quite complete and equipped with evaluation questions, development designs that are suitable with the use of current technology, as well as supporting features between participants to facilitate remote interaction of teaching and learning activities.

3.3 Independence Learning of Class X OTKP 2 Students after Using Mobile Learning Media Based on Articulate Storyline 3

The results of student learning independence from large-scale field trials in carrying out the online learning process using the O2L APP application are known in the results in the following figure, below

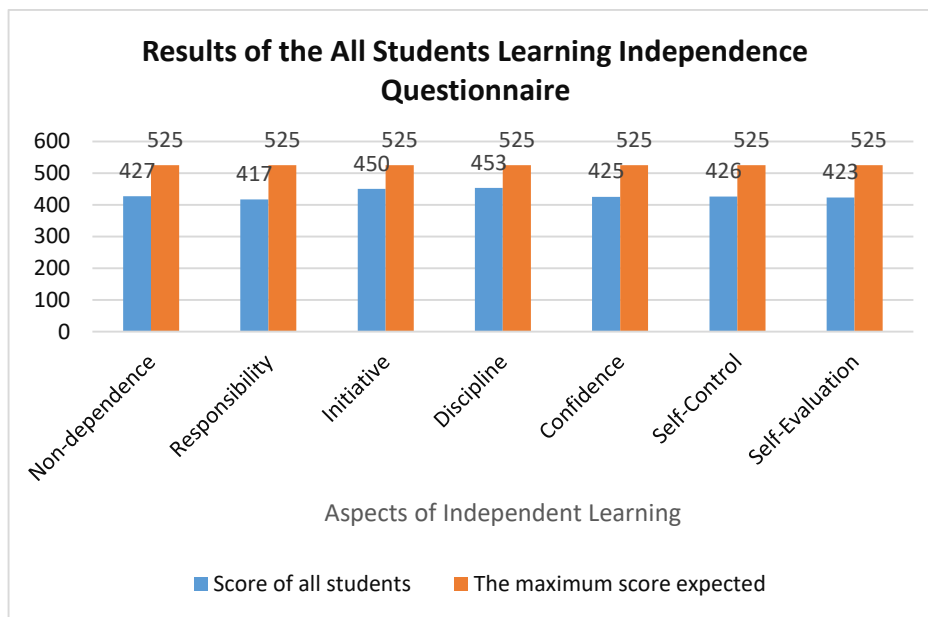


Figure 6 Results of the Independent Learning Questionnaires for Each Aspect

The percentage of quantitative data obtained can be calculated using the descriptive formula of

independent learning. On the seven aspects presented in Figure 5 below

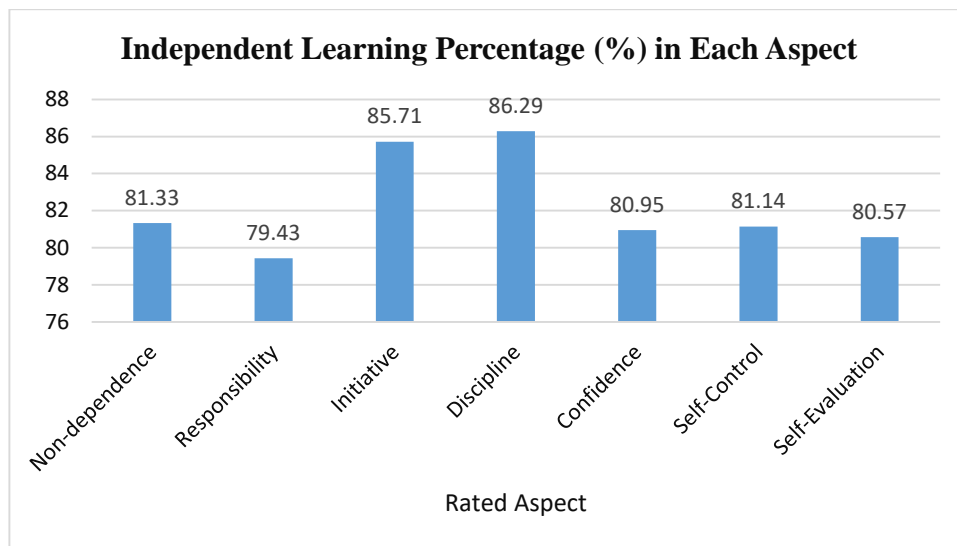


Figure 7 Percentage (%) Independent Learning in Each Aspect

The results of the analysis of student learning independence were 82.2%. This means that the independence of students means that the highest percentage is independent in the aspect of discipline with a percentage of 86.29%. It is important to maintain disciplinary aspects to equip students to face the world of work after taking vocational high school education. While the lowest percentage is the responsibility aspect of 79.43%, this is due to the delivery of learning in a new way that has never been used before. But overall it can be seen that the value of learning independence in class X OTKP 2 is 82.20% which is in the very high or very independent category. Thus, the O2L APP has been developed effectively to be used for independent learning, especially for students at Vocational High School Muhammadiyah 7 Gondanglegi Malang Regency even though the learning process was carried out online during the New Normal period.

This is one of the characteristics of independent learning even though there is no presence of teachers and friends in class, students can still carry out learning activities independently because the teacher is not the only source of knowledge but as a consultant and facilitator. [59] states that the learning process using blended learning makes the learning process easier, this can be seen from the results in the positive category with the measured aspects of learning independence, namely aspects of the discipline, aspects of the initiative, aspects of independence, and aspects of self-control. These aspects will make students a competent and ready generation to face the world of work in the 21st century [11].

[20] in his research states that using mobile learning will motivate students to learn, from this motivation that will later turn into student initiative to continue learning even in different conditions. Other research by [32] also explained that the mobile learning developed was suitable for use based on trials in the experimental class which was able to support student independence. In line with research by [41] that the learning media developed with the Articulate Storyline is declared feasible as a learning medium for independent learning. Further research and development by [60] who developed the Android-based ViPhyLab application can optimally support independent learning for learning carried out together in the classroom with teacher guidance, as well as learning carried out individually by each student.

4. CONCLUSION

Mobile Learning Media based Storyline 3 based named O2L APP in General Administration Subject can be run using the user's Android smartphone offline without internet or online network to run certain features. The use of this media in the learning process can be done by blended learning.

The feasibility aspect of Mobile Learning Media, namely O2L APP for General Administration Subject, based on the validation of media experts, material experts, and media users, it can be concluded that O2L APP was very feasible, effective, interesting, innovative, and interactive as a blended learning model.

After using mobile learning media based on Articulate Storyline 3, the independent learning of all students obtained a large average in the very independent

category. This shows that the media developed can support student learning independence in teaching and learning activities in the new normal era online and offline.

REFERENCES

- [1] H. Olivia, S. Syekh, H.A. Halim, H. Al, I. Binjai, Influence Of Information Technology Development on Management Accounting, (2019) 208–214.
- [2] A. Arsyad, *Media Pembelajaran*, Rajawali Pers, Jakarta, 2014.
- [3] M.A. Ramdhani, H. Muhammadiyah, The Criteria of Learning Media Selection for Character Education in Higher Education, *Proceeding Int. Conf. Islam. Educ. Reforms, Prospect. Challenges Fac. Tarb. Teach. Train. Criteria Learn. Media Sel. Character Educ. High. Educ.* (2015) 174–182.
- [4] H. Mohammad, A. Fuad, M. Hourani, Using mobile technologies for enhancing student academic experience: University of Jordan case study, *Int. J. Interact. Mob. Technol.* 10 (2016) 13–18. <https://doi.org/10.3991/ijim.v10i1.4809>.
- [5] C. Peechapol, J. Na-Songkhla, S. Sujiva, A. Luangsodsai, Development of smartphone application based on the theory of planned behaviour to enhance self-efficacy for online learning, *Int. J. Interact. Mob. Technol.* 12 (2018) 135–151. <https://doi.org/10.3991/ijim.v12i4.8715>.
- [6] M.H. Lin, H.C. Chen, K.S. Liu, A study of the effects of digital learning on learning motivation and learning outcome, *Eurasia J. Math. Sci. Technol. Educ.* 13 (2017) 3553–3564. <https://doi.org/10.12973/eurasia.2017.00744a>.
- [7] C. Irawan, Developing Instructional Media Mobile Learning Based Android To Improve Learning Outcomes, *J. Pendidik. Bisnis Dan Manaj.* 4 (2018) 117–124. <https://doi.org/10.17977/um003v4i32018p117>.
- [8] A.S. Ahmar, A. Rahman, Development of teaching material using an Android, *Glob. J. Eng. Educ.* 19 (2017) 72–76. <https://doi.org/10.26858/gjeev19i1y2017p7376>.
- [9] A. Shah, Suhailiezana, C.G.C. Kob, M. Khairudin, Effectiveness of m-learning applications for design and technology subject, *Int. J. Interact. Mob. Technol.* 13 (2019) 120–133. <https://doi.org/10.3991/ijim.v13i10.11324>.
- [10] M.M. Bachore, Using Mobile Phone Technologies to Maintain Quality of Education in Ethiopia: A View beyond the Prevalence of Academic Dishonesty, *Asian J. Educ. Train.* 1 (2015) 1–7.
- [11] W.P. Rahayu, S. Munadhiroh, Project-Based Psychomotor Assessment Instruments to Increase Student Competencies in the 21st Century, *Proc. 5th Padang Int. Conf. Econ. Educ. Econ. Bus. Manag. Account. Entrep. (PICEEBA-5 2020)*. 152 (2020) 342–355. <https://doi.org/10.2991/aebmr.k.201126.038>.
- [12] D. Darmawan, *Teknologi Pembelajaran*, PT Remaja Rosdakarya, Bandung, 2013.
- [13] M.K. Rajan, S.P. Kumar, Approach and Analysis of M-Learning in Higher Education, *Int. J. Adv. Res. Comput. Sci.* 5 (2014) 160–164.
- [14] K. Hidayati, E. Listyani, Pengembangan Instrumen Kemandirian Belajar Mahasiswa, *J. Penelit. Dan Eval. Pendidik.* 14 (2010). <https://doi.org/10.21831/pep.v14i1.1977>.
- [15] A.P. Laksana, H.S. Hadijah, Kemandirian belajar sebagai determinan hasil belajar siswa, *J. Pendidik. Manaj. Perkantoran.* 4 (2019) 1. <https://doi.org/10.17509/jjpm.v4i1.14949>.
- [16] A. Saefullah, P. Siahaan, I. M. Sari, Hubungan Antara Sikap Kemandirian Belajar Dan Prestasi Belajar Siswa Kelas X Pada Pembelajaran Fisika Berbasis Portofolio, *WaPFI (Wahana Pendidik. Fis.* 1 (2013) 26–36. <https://doi.org/10.17509/wapfi.v1i1.4891>.
- [17] A. Sanjayanti, D.A. Budiretnani, Tingkat Kemandirian Belajar Siswa SMAN 1 Kediri Kelas XI MIA-5 pada Model PBL Materi Sistem Reproduksi Manusia, *Semin. Nas. XII Pendidik. Biol. FKIP UNS.* (2015) 361–363. <https://media.neliti.com/media/publications/174780-ID-none.pdf>.
- [18] L. Zheng, X. Li, F. Chen, Effects of a mobile self-regulated learning approach on students' learning achievements and self-regulated learning skills, *Innov. Educ. Teach. Int.* 55 (2018) 616–624. <https://doi.org/10.1080/14703297.2016.1259080>.
- [19] D. Rahayu, H. Pratikto, W.P. Rahayu, Pengembangan Modul Pembelajaran Kontekstual Bermuatan Karakter Pada Mata Pelajaran Kewirausahaan di SMK Cendika Bangsa Kepanjen, *J. Pendidik. Bisnis Dan Manaj.* 2 (2016) 225–232.
- [20] B. Biswas, S.K. Roy, F. Roy, Students Perception of Mobile Learning during COVID-19 in

- Bangladesh: University Student Perspective, *Aquademia*. 4 (2020) ep20023. <https://doi.org/10.29333/aquademia/8443>.
- [21] A. Naciri, M.A. Baba, A. Achbani, A. Kharbach, Mobile Learning in Higher Education: Unavoidable Alternative during COVID-19, *Aquademia*. 4 (2020) ep20016. <https://doi.org/10.29333/aquademia/8227>.
- [22] M. Kanimozhi, Virtual Learning Environment, Credit Card Fraud Recognit. Using Data Min. Tech. 9 (2018) 11–15.
- [23] Y. Hanafi, N.M. Murtadho, A. Ikhsan, T.N. Diyana, Reinforcing public university student's worship education by developing and implementing mobile-learning management system in the ADDIE instructional design model, *Int. J. Interact. Mob. Technol.* 14 (2020) 215–241. <https://doi.org/10.3991/ijim.v14i02.11380>.
- [24] L. Sha, C.K. Looi, W. Chen, P. Seow, L.H. Wong, Recognizing and measuring self-regulated learning in a mobile learning environment, *Comput. Human Behav.* 28 (2012) 718–728. <https://doi.org/10.1016/j.chb.2011.11.019>.
- [25] T. Chuchu, T. Nodoro, An examination of the determinants of the adoption of mobile applications as learning tools for higher education students, *Int. J. Interact. Mob. Technol.* 13 (2019) 53–67. <https://doi.org/10.3991/ijim.v13i03.10195>.
- [26] K.T. Martono, O.D. Nurhayati, Implementation of Android Based Mobile Learning Application As a Flexible Learning, *Int. J. Comput. Sci. Issues*. 11 (2014) 168–174.
- [27] B. Andoh Charles, Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature, *Int. J. Educ. Dev. Using Inf. Commun. Technol.* 8 (2012) 136–155.
- [28] Filianti, M. Churiyah, S.B. Eko, OLA Application To Improve Self-Regulated Learning Ability And Learning Outcome Of Vocational High School Students, 7 (2020) 56–65.
- [29] F.N. Rohmah, I. Bukhori, Pengembangan Media Pembelajaran Interaktif Mata Pelajaran Korespondensi Berbasis Android Menggunakan Articulate Storyline 3, (n.d.) 169–182.
- [30] D. Sapitri, A. Bentri, Pengembangan Media Pembelajaran Berbasis Aplikasi Articulatestoryline Pada Mata Pelajaran Ekonomi Kelas X, *Semin. Nas. Jambore Konseling* 3. 00 (2017) XX–XX. <https://doi.org/10.1007/XXXXXX-XX-0000-00>.
- [31] D.H. Syah, E.W. Nugrahadi, T. Hidayat, A. Kholis, The Development of Taxation Learning Media Based on Articulate Storyline, 163 (2021) 269–273.
- [32] E.M. Rahmawati, M. Mukminan, Pengembangan m-learning untuk mendukung kemandirian dan hasil belajar mata pelajaran Geografi, *J. Inov. Teknol. Pendidik.* 4 (2018) 157. <https://doi.org/10.21831/jitp.v4i2.12726>.
- [33] R.A. Hapidz, K. Sumardi, M. Komaro, Desain Dan Pembuatan Media Pembelajaran Mobile Learning Pada Mata Pelajaran Sistem Dan Instalasi Tata Udara, *J. Mech. Eng. Educ.* 6 (2019) 71–79. <https://doi.org/10.17509/jmee.v6i1.18245>.
- [34] D.A. Wulandari, H. Wibawanto, A. Suryanto, A. Murnomo, Pengembangan Mobile Learning berbasis Android pada Mata Pelajaran Rekayasa Perangkat Lunak di SMK Sultan Trenggono Kota Semarang, *J. Teknol. Inf. Dan Ilmu Komput.* 6 (2019) 577. <https://doi.org/10.25126/jtiik.201965994>.
- [35] R.F. Rahmat, L. Mursyida, F. Rizal, K. Krismadinata, Y. Yunus, Pengembangan media pembelajaran berbasis mobile learning pada mata pelajaran simulasi digital, *J. Inov. Teknol. Pendidik.* 6 (2019) 116–126. <https://doi.org/10.21831/jitp.v6i2.27414>.
- [36] F.S. Arista, H. Kuswanto, Virtual physics laboratory application based on the android smartphone to improve learning independence and conceptual understanding, *Int. J. Instr.* 11 (2018) 1–16. <https://doi.org/10.12973/iji.2018.1111a>.
- [37] A. Mumtahana, Development of Learning Content in Computer Based Media with Articulate Storyline to Improve Civiccs Learning Outcomes in Third Grade Elementary School Students, *Int. J. Innov. Sci. Res. Technol.* 5 (2020) 777.
- [38] H. Rafmana, U. Chotimah, Pengembangan Multimedia Interaktif Berbasis Articulate Storyline Untuk Meningkatkan Motivasi Belajar Siswa Pada Mata Pelajaran PKn Kelas XI Di SMA Srijaya Negara Palembang, *J. Bhinneka Tunggal Ika.* 05 (2018) 52–65. <https://ejournal.unsri.ac.id/indeks.php/jbti/article/download/7898/pdf>.
- [39] S.I. Purnama, I.G.P. Asto, Pengembangan Media Pembelajaran Interaktif Menggunakan Software

- Articulate Storyline Pada Mata Pelajaran Teknik Elektronika Dasar Kelas X TEI 1 Di SMK Negeri 2 Probolinggo Saputra Indra Purnama, (2014) 275–279.
- [40] A.N. Yasin, N. Ducha, Feasibility Theoretical Of Interactive Multimedia Based Articulate Storyline Of Human Reproductive System Material For Senior High School XI, 6 (2017).
- [41] S. Yumini, L. Rakhmawati, Pengembangan Media Pembelajaran Interaktif Berbasis Articulate Storyline Pada Mata Diklat Teknik Elektronika Dasar Di Smk Negeri 1 Jetis Mojokerto, *J. Pendidik. Tek. Elektro.* 4 (2015) 845–849.
- [42] P. Setyosari, *Metode Penelitian Pendidikan dan Pengembangan*, 2nd ed., Kencana Prenada Media Group, Jakarta, 2012.
- [43] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*, Alfabeta, Bandung, 2019.
- [44] S. Akbar, *Instrumen Perangkat Pembelajaran*, PT Remaja Rosdakarya, Bandung, 2016.
- [45] Y. Minkova, *Contemporary Multimedia Authoring Tools*, 6 (2016) 2586–2588.
- [46] M. Wang, R. Shen, Message design for mobile learning: Learning theories, human cognition and design principles, *Br. J. Educ. Technol.* 43 (2012) 561–575. <https://doi.org/10.1111/j.1467-8535.2011.01214.x>.
- [47] L. Kong, The Development of Mobile Learning System Based on the Android Platform, *Proc. 2012 Int. Conf. MCSA, AISC* 191. (2013) 701–706.
- [48] T. Bansal, D. Joshi, G.G. Singh, A Study of Students' Experiences of Mobile Learning, *Glob. J. HUMAN-SOCIAL Sci.* 5 (2017) 45–56. <https://socialscienceresearch.org/index.php/GJHSS/article/view/1326>.
- [49] M.M. Fuad, D. Deb, J. Etim, C. Gloster, Using interactive exercise in mobile devices to support evidence-based teaching and learning, *Annu. Conf. Innov. Technol. Comput. Sci. Educ. ITiCSE.* 11-13-July-2016 (2016) 17–22. <https://doi.org/10.1145/2899415.2899467>.
- [50] A. Al-hunaiyyan, S. Al-Sharhan, R. Alhajri, A New Mobile Learning Model in the Context of Smart Classroom Environment :, *Int. J. Interact. Mob. Technol.* 11 (2017) 39–56.
- [51] A. Faradillah, D. Fadilah, Android-Based Mobile Learning Application As a Learning Exercise for Students, *AKSIOMA J. Progr. Stud. Pendidik. Mat.* 9 (2020) 1086. <https://doi.org/10.24127/ajpm.v9i4.3138>.
- [52] S.R. Nurhalimah, S. Suhartono, U. Cahyana, Pengembangan Media Pembelajaran Mobile Learning Berbasis Android pada Materi Sifat Koligatif Larutan, *JRPK J. Ris. Pendidik. Kim.* 7 (2017) 160–167. <https://doi.org/10.21009/jrpk.072.10>.
- [53] I. Adly, M. Fadel, A. El-Baz, H. Amin, Interactive mobile learning platform at the British University in Egypt, *ACM Int. Conf. Proceeding Ser.* (2018) 97–101. <https://doi.org/10.1145/3220267.3220279>.
- [54] S.H. Chung, E.T. Khor, Development of interactive mobile-learning application in distance education via learning objects approach, *Stud. Comput. Intell.* 598 (2015) 373–380. https://doi.org/10.1007/978-3-319-16211-9_38.
- [55] B.B. Jatmiko, K.H. Sugiyarto, J. Ikhsan, Developing ChemonDro Application on Redox Concepts to Improve Self-Regulated Learning of Students, *J. Phys. Conf. Ser.* 1097 (2018). <https://doi.org/10.1088/1742-6596/1097/1/012055>.
- [56] N.M. Suki, N.M. Suki, Mobile phone usage for m-learning: Comparing heavy and light mobile phone users, *Campus-Wide Inf. Syst.* 24 (2007) 355–365. <https://doi.org/10.1108/10650740710835779>.
- [57] E. Nurhayati, *Psikologi Pendidikan Inovatif*, Pustaka Pelajar, Yogyakarta, 2011.
- [58] Y.L. Wu, Gamification design: A comparison of four m-learning courses, *Innov. Educ. Teach. Int.* 55 (2018) 470–478. <https://doi.org/10.1080/14703297.2016.1250662>.
- [59] T. Al Aslamiyah, P. Setyosari, H. Praherdhiono, Blended Learning Dan Kemandirian Belajar Mahasiswa Teknologi Pendidikan, *J. Kaji. Teknol. Pendidik.* 2 (2019) 109–114. <https://doi.org/10.17977/um038v2i22019p109>.
- [60] F.S. Arista, H. Kuswanto, *Jurnal Internasional Pengajaran*, 11 (2018) 1–16.