

Development of Qr Code-Based Character Education Teaching Materials

by Olivia C. Wuwung

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Etin Solihatin¹

Universitas Negeri Jakarta

etin_solihatin@unj.ac.id

Jhoni Lagun Siang⁸

Institut Agama Kristen Negeri Manado

Roby Ibnu Syarifain⁵

Universitas Padjadjaran

Alrik Lapien⁷

Institut Agama Kristen Negeri Manado

Olivia C. Wuwung⁹

Institut Agama Kristen Negeri Manado

Kinkin Yuliaty Subarsa Putri²

Universitas Negeri Jakarta

Jeane Marie Tulung⁴

Institut Agama Kristen Negeri Manado

Esa Aryo Kuncoro⁶

Universitas Negeri Jakarta

Aldjon Nixon Dapa⁸

Universitas Negeri Manado

Alwi¹⁰

Universitas Negeri Jakarta

¹ Corresponding author: Universitas Negeri Jakarta Email: etin_solihatin@unj.ac.id

Abstract

The purpose of this research is to produce QR Code-based character education teaching materials. The method used is Research and Development with the model Dick and Carey's which includes 10 stages. The results of this study resulted in several things. First, the QR Code-based character education teaching materials with Intellectual Property Rights (IPR). Second, the feasibility of teaching materials has a score of 4.8 from material experts, 4.6 from linguists and 4.75 from media experts. Third, the effectiveness of QR Code-based character education teaching materials have a t-value count 13.077 > ttable 2.093 with t test at 0.05. This indicates a significant increase in learning outcomes for Pancasila Education. The results of the study also showed that there was an increase in learning outcomes by 23.15% after using QR Codebased Character Education teaching materials.

Keywords

Teaching Materials, Character Education, QR Code

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Introduction

Good learning should have comprehensive supporting factors such as **teaching materials**, either **in the form of compulsory teaching materials** or additional methods, media, evaluation tools and other supporting tools. But in reality, learning Pancasila Education courses with a weight of 2 credits, there are no character education teaching materials in the integrated learning process. Learning is generally dominated by cognitive aspects such as multiple-choice tests of 50 items as an evaluation tool used. The material "Pancasila and anti-corruption values" is given as enlightenment in science, but it is necessary to add certain character values that need to be instilled and cultivated in students. It aims to form a good character in students with the hope of minimizing cheating in all aspects of life in order to form a good next generation.

Based on the conditions and problems that can be categorized as urgent, this development research needs to be carried out. This is supported by the mandatory output that is produced **in the form of** research products in **the form of** books/**teaching materials**, equipped with Intellectual Property Rights (IPR), other mandatory outputs in the form of articles published in international journals indexed by Scopus. The resulting teaching materials must of course have relevance to the 4.0 industrial revolution with the use of technology in all fields such as QR Code-based teaching materials. QR Code is a matrix and dimension symbol consisting of a combination of black and white squares arranged in a field bounded by a square-like frame with obtuse angles with an area of the pattern that determines the version of the QR Code (ISO/IEC 18004, 2000 (Liantoni, Rosetya, & Rahmawati, 2019); SABRI, ABAS, and DIN (2021)). QR code (Quick Response Code) was developed as a **code** classification that allows high-speed reading using image capture technology with a QR Code Scanner (Edinger, Bar-Shalom, Sandler, Rantanen, & Genina, 2018). Based on several studies already published research results in the journal, then kebaruan (Novelty) This research is a QR Code-based teaching materials. So far, the QR Code is used by electronic companies in Japan. Thus, when looking for QR Code-based teaching materials, it is relatively faster than teaching materials without using a QR Code.

Literature Study

Development of Teaching Materials

The focus of development in this research, is expected to answer various needs related to learning. Development is triggered by the existence of "Verstehen" as understanding and sensitivity to symptoms, events, and events that become the focus of attention in certain situations (Faradilla & Hasan, 2018). Sensitivity is the basis of development in understanding every condition, so that the products resulting from development research are needed to answer the demands for improving the quality of knowledge, attitudes, and skill. According to Pavez (2021) teaching materials (Learning Materials) are everything that is the content of the curriculum that must be mastered by students according to competence in order to achieve competency standards. This means that teaching materials are an important part of a learning process. Teaching materials are designed systematically based on a certain curriculum, and packaged in the form of the smallest learning unit, and allow students to learn independently in a certain time unit (Nasruddin, 2020). Teaching materials are all forms of materials used to assist teachers, both lecturers and teachers in carrying out learning activities (Risnawaty, Arfanti, Sembiring, Siregar, & Sugiharti, 2021). Teaching materials (Instructional Materials) are a set of knowledge, skills, attitudes that must be learned by students in accordance with basic competencies in order to achieve predetermined competency standards (Widiyawati, Rusmin, & Widodo). Teaching materials are lecture materials that are systematically arranged which are used to assist lecturers and in carrying out lecture activities.

Teaching materials can also be called learning materials other than instructional materials which include visual aids such as handouts, slide overreads, which consist of text, diagrams, pictures, photos, audio, video, and animated videos (Butcher, Davies, & Highton, 2006). In addition, teaching materials are also known as teaching materials which are seen as materials provided for learning needs which include textbooks, videos, audio (Bal-Gezegin, 2014). Based on this, it can be seen that teaching materials are a set of materials that are systematically arranged for learning needs, both in the form of printed materials, as well as in the form of audio, visual, multimedia, and

Web-based materials.

Independent learning as a learning activity carried out by students freely determine learning goals, learning directions using the learning resources they choose, making academic decisions and making efforts to achieve the learning goals to be achieved (Dmoshinskaia, Gijlers, & de Jong, 2021).

Table 1.

Review of research results published in journal as supporting state of the art

No	Year of	Research from Journal Article	Results
1.	2009	Teachers Perception of The Role of Media in Classroom Teaching in Secondary Schools The Turkish Online Journal of Educational Technology, 8(1) (Taiwo, 2009)	Research results shows that there is a significant difference between students who have a high intensity of utilization of learning resources and students who have high intensity as utilization of learning resources is low regarding learning achievement.
2.	2006	Utilization and Benefits of Instructional Media and Teaching Social Studies Course as Verveived by Omani Student. Malaysian Online Journal of Instructional (Abdelraheem & Al-Rabane)	The results show that the use of textbooks in the classroom is still very dominant.
3.	2010	A Hubrid client/server and browser/server mode-based universal mobile Ticketing System. In IEEE International Conference on Information Management and Engineering pages 691-695. (Hu, Wang, Li, & Li, 2010)	The results show that this system will provide convenience and comfort for users in conducting ticket transactions so as to implement a data security system on tickets using QR Code media.
4.	2011	Use of NFC and QR code Notification in an electronic ticket system for public transport (Finzgar & Trebar)	The results show that customer responses are very positive towards the use of QR Codes in the form of tickets, because they feel it is easier to just show proof of tickets QR Code from smartphone screen.
5.	2020	Development of Teaching Materials' Quantitative Research Methodology for Student Based on QR Code, Pal Arch's Journal of Archeology of Egypt 17 (5):395-4080. Sqopus Q3 (Solihatin, Syarifain, Siang, & Sukardjo, 2020)	The results showed that the learning outcomes of quantitative research methodology increased significantly after the application of QR Code-based teaching materials

Character Education for Generation Z

Character education as mandated by Law no. 20 of 2003 concerning the National Education System in article (3) states that national education functions to develop capabilities and shape the character and civilization of the nation that is useful in the context of the intellectual life of the nation. Character education can be done in formal and informal education in general. Character education in Indonesia is already running like in several other countries. such as England, America, and Finland. However, when viewed from the differences in the characteristics of each generation, a different approach is needed to achieve optimal results as described in table 2.

Generation Z

The term generation Z is currently viral, especially on social media, more often referred to as the phrase "kids today". Generation Z is present as a form of differentiation between the millennial generation because the millennial generation is a generation born from 1981 to 1994 with the age

of 23 to 38 years in 2020, while generation Z is a generation with an age range of 7-24 years who generally take basic education to college. high (Gabrielova & Buchko, 2021).

Table 2.

Comparison of Dominant Characteristics in Each Generation based on Birth Year of

Generations	Birth Year	Dominant Characteristics
Traditionalist	1900-1945	Loyalty and discipline
Baby Boomers	1946-1964	Responsible and have a strong work ethic
Generation X	1965-1980	Independent thinkers efficient in acting
Generation Y (Millennials)	1981-1994	Have a more dominant social side, confident, less independent
Generation Z	1995-2012	Have communication skills relatively low physical use of technology in almost all fields is higher

Source: (Ferraro & Prasse, 2021; Glass, 2007; Wiedmer, 2015)

Generation Z is in an environment of technological development that is developing rapidly in human civilization. this is evidenced by the launch of the iPhone in 2007 when the oldest age of this generation is 12 years. Then, it was followed by the launch of the Android Operating System in 2008. During the teenage years, Generation Z was introduced to Wifi, High-bandwidth cellular services, and social media. Generation Z is a generation that plays an important role in achieving a golden Indonesia because this generation will be at a productive working age in 2045 with an age range of 36-47 years.

Merriman (2015) states that Generation Z's high dependence on the internet allows them to earn in a short time without significant obstacles. Although Generation Z lacks physical and social interactions, they have abilities multi-tasking that can be relied on on social media (Stratton, 2021). Capabilities multi-tasking are Generation Z's obtained from daily routines such as reading a book while listening to music on the Ipod and at the same time updating status on social media. The internet makes generation Z relatively impatient and easily needs instant gratification, introverted, and detached from society (Salleh, Mahbob, & Baharudin, 2017). They are a generation that rarely gets attention due to the busyness of both parents who are the Baby Boomer generation and the younger generation. millennial. This causes Generation Z to have a high dependence on technology, so that some psychologists say they find it difficult to focus on the things they should be doing due to experiencing "Acquired Attention Deficit Disorder." Edward Hallowel stated that people become more busy with many things, so they become easily distracted, irritated, impulsive, restless and in the long run low achievers. A clinical professor of psychiatry at Harvard, specializing in neuropsychiatry, John Ratey, uses the term "Acquired Attention Deficit Disorder" to describe the role of technology in restructuring the mind (Evers, Albury, Byron, & Crawford, 2013).

Character Education Character

According to Coon in (Rahiem, 2021) describes character as a subjective assessment of a person's personality related to personality attributes that can or cannot be accepted by society. Character means character or personality. Character is the totality of natural dispositions and dispositions that have been stably mastered, which defines an individual in his overall system of psychic behavior which makes him typical in the way of thinking and acting.

The expected education is to consciously prepare students with activities and teaching that are in accordance with the challenges of the times in the future (Fitriyani, Supriatna, & Sari, 2021). In a contextual learning process it will be meaningful learning, because it is always associated with real life in the context of a personal environment. , social and cultural (Saputra, Sukestiyarno, & Dwidayati, 2021)

According to AH Ibrahim Ulusoy (2021), educational practice in Indonesia tends to be more oriented towards-based education hard skill (technical skills) which is more about developing intelligence quotient (IQ), but lacks soft skill development. contained in emotional intelligence (EQ), and spiritual intelligence (SQ). Learning in various schools and even universities place more emphasis on obtaining test scores or exam results. Many teachers have the perception that students who have good competence are those who score the test or exam is high.

Seir With the development of the times, education that is only based on hard skills, namely producing graduates who only have academic achievements, must begin to be addressed. Now learning must also be based on the development of soft skills (social interaction) because this is very important in shaping the character of the nation's children so that they are able to compete, be ethical, moral, polite, and interact with the community. Education is soft skills based on mentality so that students can adapt to the realities of life. A person's success is not determined solely by knowledge and technical skills (hard skills), but also by the skills to manage oneself and others (soft skills).

Implementation of Integrated Character Education

According to Manzoni, Caporarello, Cirulli, and Magni (2021) in technology-based education applications there are two things that need to be considered, namely the ease of obtaining the technology to be used and the accuracy of the technology to be used. In his research, the technology device chosen was an Android-based tablet with software spectrum analyzer in the Physics learning process which was proven to maximize the absorption of Generation Z students on stationary wave material. Character education is part of human life for centuries in shaping a civilization that has four concepts. The concept first of character education is that character is not taught but is a process of forming habits such as internalizing values, making good choices, doing it as a habit by providing examples. The concept second of character education is that in educating the character of the younger generation, it must consider the situation and the commission of the times. The concept third is in providing education on problems, things that must be considered include the situation, process, material, and evaluation of character education activities. The concept fourth states that character education is a process that never stops (Rokhman, Hum, & Syaifudin, 2014).

The key in educating Generation Z in achieving Indonesia gold 2045 is both in academics through Problem Based Learning with Technology Based Learning Through the creation of applications Android-based. Based on this, the role of the younger generation that can contribute to building Indonesia Emas 2045 is by making innovations, one of which is by creating various Android-based software that helps Generation Z to learn and understand the material being studied, such as educational game software, calculation formula applications, or applications. a dictionary that contains important terms in lessons or applications that provide animation or an overview of what is being studied. Android-based software is the ideal software to use in educating Generation Z because almost all Generation Z has an Android-based smartphone and can operate it properly. Therefore, guiding Generation Z in achieving a golden Indonesia 2045 can be done through education and, through academic activities in schools and character education, both at school and in the community. Character education is carried out using Problem Based Learning with Technology Based Learning through the creation of applications android-based. The difference is the application of Virtual Reality in character education, so that it is more interesting for students, in this case Generation Z, in carrying out character education. Can experience direct interaction with a taste similar to game quests, but with additional benefits in the form of character improvement in order to form generation Z who has social sensitivity, is tough, and lacks the courage to make risky choices, in order to shape the generation to achieve golden Indonesia 2045. Starting from today with the help of young people who innovate in making the required software.

QR Code

QR Code is a two-dimensional matrix symbol consisting of a string of squares arranged in a larger square pattern. The extent of this square pattern will determine the version of the QR Code (ISO/Iec 18004, 2000). Quick Response Code or commonly referred to as QR Code is a two-dimensional barcode introduced by the Japanese company Denso wave in 1994. This type of barcode was originally used for data collection of vehicle parts production inventory, and is now used in various fields of business services and also for marketing and promotional activities. Basically, the QR Code was developed as a code that allows contents to be translated at high speed (Rouillard, 2008). The advantage of QR Code is that it is able to store information horizontally and vertically. Therefore, QR Codes can accommodate more information than one-dimensional barcodes (Grillo, Lentini, Querini, & Italiano, 2010).

Currently, the use of QR Codes has been widely implemented in the form of QR Code Reader applications and QR Code Generators, so that someone will be very easy to create information in the form of QR Codes and get the information they want to know just by scanning and scanning data through media from cellphone cameras. (Anastasia, Istiadi, and Hidayat, 2010).

Research Method

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This study uses the method Research and Development with Dick and Carey's (Dick, Carey, & Carey, 2015). Dick and Carey's covers ten stages which can be illustrated in the diagram below.

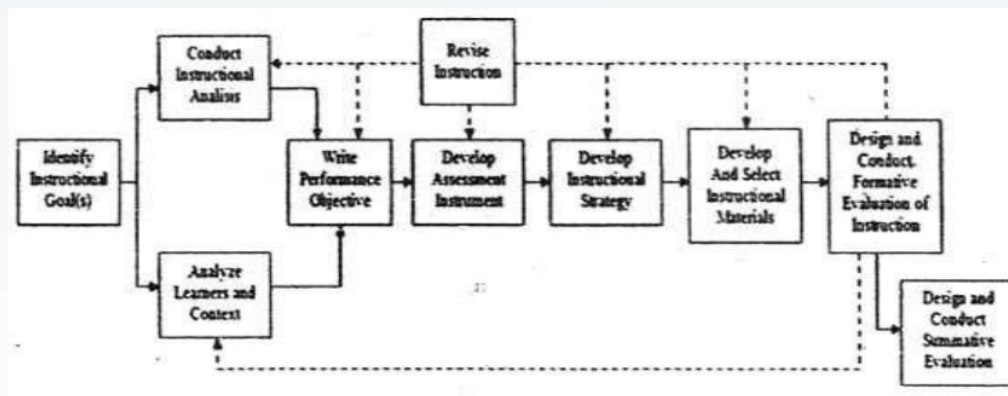


Figure 1. Dick and Carey's Model

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Results and Discussion

Based on the needs analysis of the development of QR Code-based character education teaching materials, through interviews and observations to Pancasila Education lecturers and students. From the results of the needs analysis, it was identified that the implementation of Pancasila Education learning, didn't still experience difficulties in learning according to the needs of students (students). Lecturers and students support QR Code-based Character Education teaching materials. The research team hopes that the use of QR Code-based Character Education teaching materials can make it easier to understand abstract concepts that are realized in everyday life using the Dick and Carey's model in 10 stages.

In the first stage, the researcher identified the general learning objectives based on the needs analysis. Learning Outcomes Subjects (CPMK) mastering Pancasila and anti-corruption values, with sub CPMK a) understanding the meaning of corruption; b) explore the factors causing corruption; c) understand the impact of corruption; d) understand the values and principles of anti-corruption; e) describe efforts to prevent corruption; f) understand anti-corruption education. From the data identified, the researcher concludes that there are no QR Code-based Character Education teaching materials that are integrated in Pancasila Education, on anti-corruption values, although there are other supporting books.

In the second stage, the researcher conducted a learning analysis. Classify learning objectives. Using various sources of books, not teaching materials made by lecturers who teach these courses, according to the semester learning plan. The third stage, researchers analyzed the characteristics of students. Character analysis is a stage that is carried out to obtain references about the overall character of students as the basis for making teaching materials. The fourth stage, researchers formulate indicators. This is made based on the results of learning analysis which is then developed into specific objectives (Instructional objectives) that are mastered by students, to achieve general learning objectives (Instructional goals). The fifth stage, the researcher develops an instrument or test tool. The test tools are in the form of an evaluation sheet on a pretset, and a post test, which serves to measure the ability of students in learning Pancasila Education. The sixth stage, researchers develop learning media. Learning media is used to make learning more interesting, easy to understand, increase absorption of Character Education material that is integrated in Pancasila education.

In the seventh stage, the researcher designs a learning program by implementing a learning

strategy with the media that will be used. The media that will be used by researchers at this stage is a QR Code-based learning media. The eighth stage, the researcher designs and develops formative evaluation. Formative evaluation was carried out to collect data related to the strengths and weaknesses of QR Code-based teaching materials. The results of the formative evaluation process can be used to determine the feasibility of the product. The ninth stage, the researcher made a revision of learning. This is done after the formative evaluation stage, the results obtained from the formative evaluation procedure are summarized, and interpreted to find out the weaknesses of the QR Code-based Character Education teaching materials.

The tenth stage, the researcher designs and carries out a summative evaluation. Summative evaluation is research conducted at the peak of activity

1. Research Instrument Requirements Test

The instrument for displaying the QR Code-Based Character Education teaching materials by students (student) is tested for validity and reliability. Of the 15 item statements, the number declared invalid (dropped), namely item number 4 and number 9. Thus, 13 items were declared valid. Based on the calculation of the reliability of the instrument, the feasibility of QR Code-based Character Education teaching materials, by students by calculating the reliability of r_{11} displaying the = 0.940 in the category (0.800-1.000), then the instrument has high reliability. Character education learning outcomes test instrument is used to find data in the field, first tested for validity and reliability. Based on the initial test instrument, the learning outcomes of QR Code-based Character Education are 25 items (questions). Based on the results of the calculation of the validity test, the items that were dropped (declared invalid) were numbers 4,6,11,19,23. Thus there are 20 valid question items that can be used further. From the calculation of the reliability results $r_{11} = 0.992$ included in the category (0.800-1.000), then the instrument has a very high reliability.

2. Feasibility of Character Education Teaching Materials by Material, Language, and Media Experts.

The feasibility of QR Code-based Character Education teaching materials, which are integrated into the Pancasila Education course for the subject of anti-corruption values. These teaching materials are given to material experts to be assessed for item descriptions of 11. The score obtained from the assessment of material experts is 4.8. After that, the feasibility of character education teaching materials was assessed by linguists with 5 items. The score obtained from the assessment results is 4.6. Then, the feasibility of character education teaching materials was assessed by media experts with 8 description items, and got a score of 4.75.

3. One to One Test

The One-to-One test was given to 3 students, the results were good and they got an appreciation for the learning of Pancasila Education integrated with character education, so that not only cognitive/knowledge is received, but there are aspects of attitude and application in its implementation in everyday life, and can be learned anytime and anywhere by scanning the QR Code.

4. Small Sample Test

The small sample test was given to nine students who took the Pancasila Education course, using QR Code-based Character Education teaching materials. the nine students consisted of three people who got the highest UTS score (considered smart), 3 people who had low UTS scores (considered having moderate ability). And three students who have low UTS scores (considered having less ability), so they need to be removed in Pancasila Education lectures or given additional assignments to get added value scores. Based on the results of a small sample obtained an average value of 4.7.

5. Large Sample Test

To see how the effectiveness of teaching materials-based character education QR Code,

dilakukan pretest against the student as many as 20 people. The score of Pancasila education learning outcomes before using QR code-based Character Education teaching materials, namely the pretset value x (7.125) with a standard deviation of 0.61719, while after using Character Education teaching materials the x post test score (8.7750) or increased by 1.65 points or equivalent to 23.15%. Based on the results of the t test with 0.05, it was obtained t_{count} (13.077) > t_{table} (2.09302) which indicated a significant increase in learning outcomes after the use of QR Code-based Character Education teaching materials.

The results of this study are in accordance with Deshmukh and Kulkarni (2021) that a combination of text and visuals in teaching materials improves learning outcomes compared to text-based teaching materials. This is also supported by research by Permatasari and Andriyanti that the use of media is very effective because of the integration of text, images, which are narrated in an integrated manner.

Conclusion

From the results of the research that has been carried out, it can be concluded several things. The QR Code-Based Character Education teaching materials have been completed and submitted by HKI (Intellectual Property Rights) to the Institute for Research and Community Service (LP2M) State University of Jakarta. The QR Code-Based Character Education teaching materials received an assessment from material experts of 4.8, linguistic experts of 4.6, and media experts of 4.75. The effectiveness of QR Code-Based Character Education teaching materials significantly improved learning outcomes t_{count} (13.077) > t_{table} (2.09302) with an increase of 1.65 points or 23.15% with a mean value of posttest 8.7750 compared to a mean of pretest 7.125.

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