



Development of Collaborative Learning Materials Based on QR Code to Facilitate Learning

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The purpose of this study is to produce collaborative learning materials based on QR Code to facilitate learning. Which can be used for independent learning. The methodology used is one of research and development. The product testing phase begins with testing material, media and learning design experts. Subsequently, the product was tested with a number of students, namely three students for a one to one evaluation, eight students for small group evaluation, and twenty for field evaluation. The result of this study showed the value of material, media and learning design experts was very good. Average results for the individual test was 3.57 and means the product was considered very good. The small group trial was 3.47 which is also seen as very good, and at for the field test 4.21 was similarly considered very good. From this it was concluded that collaborative media learning materials can be effective but there is greater improvement required in line with expert and user advice.

Key words: research and development, collaborative, learning material, QR Code



Introduction

The development of science and technology enables all users to obtain large amounts of information quickly and easily from various sources from anywhere in the world. In the face of this, students need to have the ability to obtain, select and manage information to survive in ever-changing, uncertain and competitive circumstances. To do this requires an ability to think systematically, logically, creatively, rationally and with the desire to cooperate. These skills can be developed through collaborative learning because media materials and hyper-content have a strong and purposeful connection between the concepts taught and the development of information communication technology.

Humanity is entering forth Industrial Revolution where the application of cyber physical systems for automation and data exchange are being developed or, in fact, exist. This tremendous acceleration and progress has increased effectiveness and efficiency in a range of fields and we are now faced with the growth of smart factories, cities, learning, and digitalisation. This situation requires professionals in educational technology to play many roles both directly building instructional designs for smart learning as well as designing supporting components. The rapid expansion of digital technology has influenced the field education, specifically teaching and learning. Terms such as distance learning, virtual education-based education, internet, web-based education, and education through computer-mediated communication now prevail.

An optimal utilisation of learning resources improves student learning achievement. This is in line with research that compares student achievement using learning resources and those who do not. With regard to learning achievement, the study found differences between students who had high utilisation of learning resources and students who had low use of learning resources (Taiwo, 2009: 8). The rapid development of science and technology brings about an increased need to access learning resources so that people can learn independently. Advancing from the industrial era to the information age requires changes in various fields, including education. In the information age, students face are overwhelmingly confronted by information all at once and more than ever. This information is disseminated through print and electronic media, from simple to sophisticated technology such as the internet and other communication platforms.

In light of the above, this study is concerned with QR Codes and how they are widely used by companies and service providers to direct customers to a destination URL address (Anonymous, 2011). QR codes can be found in magazines, posters, or other print media and are used to expose everything the company or service provider wishes to convey through their site. The research query centres on why QR codes are not used in education? QR codes are helpful in the learning process as they make links for students to supporting materials. This means that the QR code can be used as a learning resource. Quick Response Code or often



abbreviated as QR Code is a two-dimensional barcode introduced by Japanese Company Denso Wave in 1994. This type of barcode was originally used to track inventory in vehicle manufacturing and is now used in a variety of trade and service industries. Fundamentally, the QR Code was developed as a code to allow its content to be translated at high speed (Rouillard, 2008).

Each learning resource has a different role, depending on how the learning resource is used. In learning, students, not only interact with the teacher as a source but also interact with all learning resources for the purposes of achievement. Such a resource is The Curriculum Master Guide (MG), a youth department leadership program at the Seventh-day Adventist Church used to train youth leadership. The Master Guide acts as a foundation for youth ministry leadership and helps youth leaders remain sharp, up-to-date and focused. The results of interviews with the Instructor (Master Guide) conducted at the Seventh-day Adventist Church indicate that one significant problem must be resolved. That problem is that ‘learning resources, such as textbooks, are only available in English and incomplete so it is very difficult to teach’ (Manik, 2019). The researcher also interviewed the prospective Master Guide and the results show that: ‘it is not comfortable learning because the method used by the instructor is only the lecture method, it is difficult for us to do the assignments and the unavailability of lesson material’ (Siregar, 2019).

As stated by Januszewski and Molenda (2008), the problems of educational technology to solve learning problems is based on a set of principles and uses a variety of approaches. ‘Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources’ (Januszewski & Molenda, 2008). That is, educational technology is the study and ethical practice to facilitate learning and improve performance by creating, using and managing appropriate technology processes and resources. The philosophy accounts for patterns of education and learning by concurrently developing and utilising learning resources alongside conditions and needs. Researchers feel the need to solve appropriate problems, especially providing learning resources specifically made for them.

Of the many studies conducted on collaborative media, there is no research and development of learning models that collaboratively facilitate the learning of prospective Master Guides. Given this, researchers actively sought to develop ‘collaborative media to facilitate the learning of prospective Master Guides.’



Literature Review

1. Study

The 'learning process' sits at the heart of education. 'Learning is an enduring change in behaviour, or in the capacity to behave in a given fashion, which results from practice or other forms of experience' (Dale H. Schunk, 2012). Learning is a lasting change in behaviour, or in the capacity to behave in certain ways, the result of practice or other forms of experience. Anurrahman (2010) sees learning as a process carried out by individuals to obtain a new change in behaviour as a whole, and as a result of the experience itself in interaction with its environment (Anurrahman, 2010).

Learning is an activity both with the guidance of the learner and with his own business entirely. The presence of other people, including learners, is intended to make learning smoother, easier and more successful (Miarso, 2007). In learning, activities require interaction between learners and learning resources; so in order to gain maximum results, the level of interaction must be high. Interactions need to be developed systematically and, likewise, learning resources need to be developed and managed systematically and function well.

Advances in science and technology impact the world of education. Therefore, education and the learning paradigm experience a shift and transformation (Spector, 2009). These shifts (i) focus on the holistic development of the individual, (ii) have learning not only occurring in the classroom but via the environment, (iii) see the model of communication between educators and learners as more interactive and democratic, (iv) assess learning not only by results but through process, (v) emphasise the diversity of learning demands and the educators' sensitivities to these. This paradigm shift has implications for the learning process, learning resources, the role of educators-students and learning evaluation overall.

Learning in the face of Education 4.0 can take place without having to learn in the classroom because the development of learning resources, especially information and communication technology is fast. The way in which we learn no longer depends on the teacher as a source of all knowledge and information; learning can take place at anytime and anywhere. The learning process is no longer a form of verbal communication between student learners and teachers. Students can learn anything in accordance with their interests and learning styles. But in reality diverse learning resources are generally not fully utilized (Percival, 1993). It is important to realise that learning is a system, in which there are a number of interconnected that serve to achieve a particular goal: (i) objectives, (ii) teaching materials / materials, (iii) methods, (iv) tools/media and; (v) evaluation (I Ketut Suda.). Learning is a system of learning success and is largely determined by the extent to which the effectiveness of each component interacts.



2. Learning Media

Media is needed in education and interesting, interactive media can make students enthusiastic in learning so that the material delivered can be retained. In the learning process, teachers cannot work alone to make students learn, they must also be assisted by good quality learning resources and learning media. According to Dewanto (2015), learning that is formulated can increase the knowledge and skills of the competencies needed (Dewanto, 2015). To support teaching, teachers need media that can be used in teaching. Textbooks, CDs/DVDs, picture cards, posters, internet aid both teachers and students to understand the world around them.

Collaborating is making something with other parties. There are several similar terms, namely: cooperative learning, learning groups, or assisted learning. Collaborative learning is designed to carry out complete learning. Learning will not stop if each student does not understand the learning objectives or aims. They continue to consult/share with the teacher. According to Barkley, collaboration means working together with other people. The practice of collaborative learning means working in a manner in pairs or in small groups to achieve goals joint learning. Collaborative learning means learning through work groups, not learning in solitude (Barkley, 2014).

3. Learning resources

The learning process is significant, meaningful and effective when a broad range of relevant resources are used. Choosing relevant and meaningful resources allows for a broader understanding and picture of the subject. The problem today is how the teacher designs and uses learning resources. At present, learning resources vary greatly in order to provide differentiated learning and access to information. Students not only benefit from textbooks, but from other learning resources such as educational radio, television, teleconferencing, e-mail, interactive video, satellite communication and multimedia technology to increase interaction and provide understanding.

Mcisaac and Gunawardena (1996) state that learning resources are not only in the form of printed materials such as textbooks, but learners can utilise other learning resources such as radio education, television, computer conferencing, e-mail, interactive video, satellite communication and computer multimedia technology to increase interaction and provide mutual feedback with learners (Gunawardena, 1996). Similarly, Lillouati's research (2017) shows that the use of learning resources in the learning process at SDIT is motivated via messages at 70%, human learning resources at 74%, learning materials at 66%, learning resources in roads are listed at least 49%, educational resources in the good category at 74%; and environmental learning resources, including classes that are quite good at 69%. One of the most widely used learning resources are human learning resources and methods. Efforts to use learning resources in the learning process at SDAT include an effective classroom management strategy at 71% (Lilawati, 2017).



Research Methodology

The purpose of this study is to produce collaborative media for prospective Master Guides that are suitable for use as independent learning materials. This research was carried out by the Seventh-day Adventist Church. The target audience is the prospective Master Guides in the Church.

This research aims to produce or develop a product, namely a model informed by Dick, Carey and Rawntree. In combining two models, a detailed and suitable step-by-step guide can be produced for use by prospective master guides. A research and development methodology assists in creating and testing a particular product for its effectiveness (Sugiyono, 2012). With regard to the field of R&D, developing products that are effective for the needs of educational processors constitutes applied research. This research is more concerned with change for improvement rather than increasing its usefulness in education.

Results and Discussion

With regards to Table 1 below, the results of the study show the acquisition of an average score at the expert testing stage. The average score of material experts is 3.28 and means the product is considered good; the media expert is 3.68 and the learning design at is 4.07, and also demonstrates that the product is very good. In the test phase with the teacher, the average score for one to one was 3.57, and verifies that the product was considered suitably good.

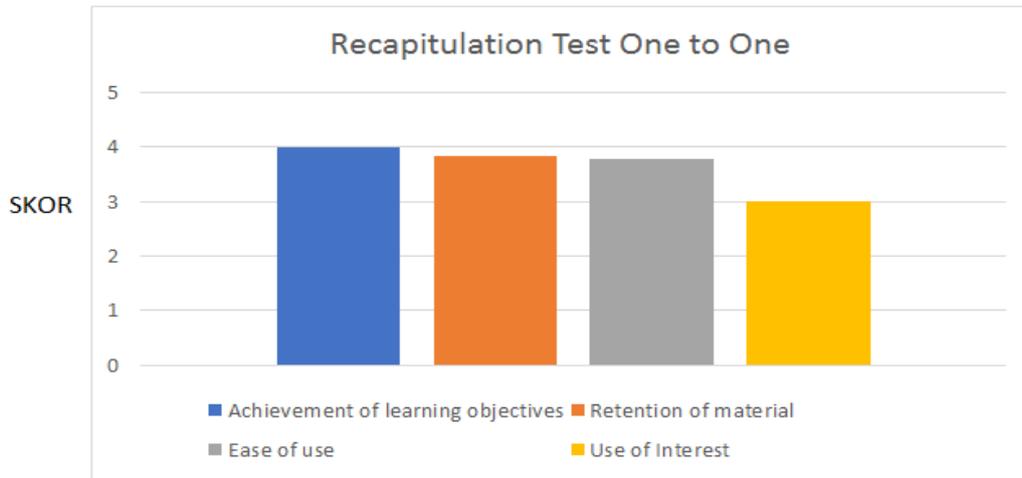
Table 1: Value for one to one test

No.	Aspects Assessed	Respondent			Average
		X	XX	XXX	Rating
1	Achievement of learning objectives	3,00	4,00	5,00	4,00
2	Understanding of material	3,75	3,75	4,00	3,83
3	Ease of use of <i>online learning</i>	3,67	3,67	4,00	3,78
4	Interest in the use of <i>online learning</i> programs	3,50	2,00	3,50	3,00
Average					3,57

From the results illustrated in Table 1 above, it can be concluded that developed collaborative media is included in a good category and justifies the achievement of learning objectives with a score of 4.00.

In terms of providing understanding of the material to students, learning materials developed are categorized as good with a score of 3.83. In the aspect of convenience, respondents gave a score with an average score of 3.78 and can be categorized as good, while in the aspect of interest the average score obtained was 3.00 with a sufficient category.

Figure 1. Recapitulation One to One Test



At the small group stage of 3.47 which means the product is considered very good.

Table 2: Recapitulation of Small group evaluation

No.	Aspect assessed	X	Total Score	Note
1	Readability flow	5	4.7	Very good
2	Relationship between aspects	4	4.3	Very good
3	Conformity to needs	4	4.7	Very good
4	Reflect RTI learning	5	4.7	Very good

With regards to Table 2 above, researchers can conclude that learning media developed online and in print can be understood by students. The ease of use, as well as the attraction shown as a medium, greatly assists students to improve their understanding of learning for prospective master guides.

The results of the developed and improved products are implemented to twenty prospective master guide students. The results of this can be said to be good, effective and appropriate for use in learning. This is evident from the results of implementation/field tests conducted by assessing students' reactions to the use of collaborative media and assessing effectiveness through tests of students' cognitive levels.

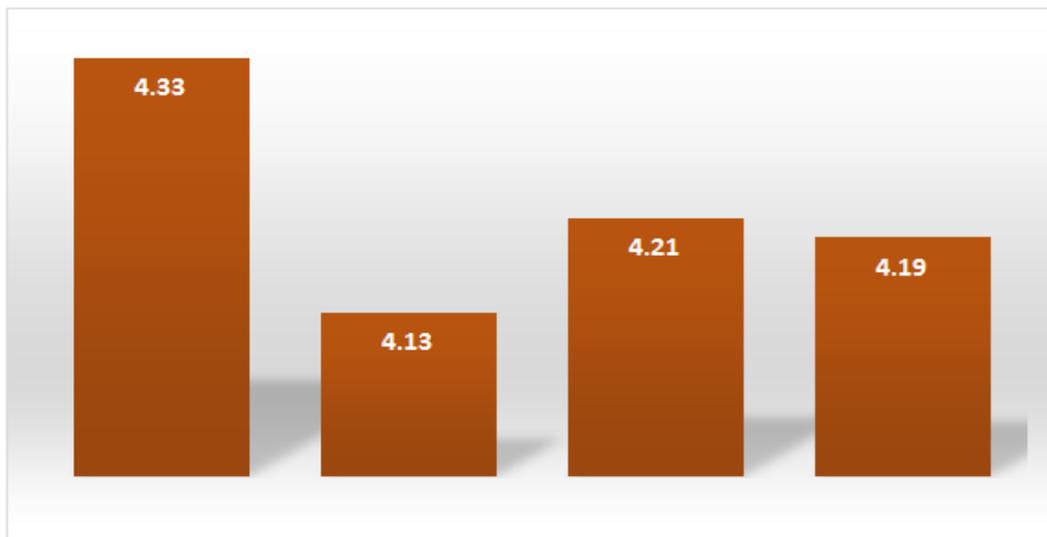
a. The feasibility of the product being developed

The results of evaluating student reactions, as users, are done via questionnaires. The results of the assessment can be seen in Table 3 below:

Table 3: Recapitulation of Field Test Results Assessment

No.	Aspects Assessed	Average
		Rating
1	Clarity of learning objectives	4.33
2	Understanding of material	4.13
3	Ease of use	4.21
4	Interest in program use	4.19
Average		4.22

Figure 2. Graph of Product Assessment Recapitulation in the Field Test



The aspects assessed at this stage relate to the clarity of learning objectives and understanding the material via its ease and interest of use. In the clarity of learning objectives, respondents gave an assessment with an average of 4.33. At the level of understanding the material, respondents gave an average value of 4.13. At the level of ease of use, respondents gave an average value of 4.21 and from the level of interest in use, an average rating of 4, 19. From the overall value generated, development collaboration falls in the good category. It can be concluded that the media developed can be understood, is easy to use and attract student interest.

b. Effectiveness of products

To measure the effectiveness of media collaboration, researchers test the cognitive levels of students by comparing learning outcomes before and after via developed learning materials.

Measurement of students' cognitive abilities is carried out using test instruments (pre-test and post-test multiple choice). The results of these tests can be seen in Table 4 below:

Table 4: Student Cognitive Test Results

No	Participants	Pre Test	Values Post Test
1	X1	66.7	76.7
2	X2	66.7	76.7
3	X3	70	73.3
4	X4	56.7	80
5	X5	76.7	83.3
6	X6	46.7	73.3
7	X7	46.7	73.3
8	X8	63.3	76.7
9	X9	56.7	80
10	X10	63.3	73.3
11	X11	60	80
12	X12	63.3	73, 3
13	X13	60	76.7

14	X14	40	76.7
15	X15	63.3	73.3
16	X16	40	63.3
17	X17	70	70
18	X18	53.3	66.7
19	X19	60	73.3
20	X20	53.3	60

With regards to Table 4 above, an average value of pre-test is 58.73 and an average value of post-test 74.12. From this data, a significant test of learning outcomes was subsequently carried out using the t-test to determine the effectiveness of collaborative media on students' cognitive improvement.

Table 5: Calculation Results for Improving Student Cognitive Abilities

	POST TEST	PRE TEST
N	20	20
Average	15,39	
SD	8,19	
df	19	
t count	7,81	
t tabel	0,05;20 = 2,0859	

Table 5 above reveals that the $t \text{ count} = 7.81 > t \text{ table} = 2,0859$ and it is evident that a significant increase in students' cognitive abilities has occurred. With these differences, it can be concluded that the developed media is effective for prospective master guides.

Discussion

The Dick and Carey learning model inform the explanation and development of the learning steps in the research development:

a. Requirement Analysis Phase:

Development of instructional media is an important requirement at this time. Through observation and analysis, the current situation is far from perfect because the instructor does not yet have teaching material/media. This gap becomes an important needs analysis

for researchers in order to develop collaborative learning media that is adapted to the model of student characteristics and curriculum.

b. The planning stage:

Based on factual analysis and findings, the planning stage determines the steps in preparing learning media that are reflective students' characteristics, namely: (a) formulating general learning goals and specific learning objectives, (b) formulating the form of learning implementation to be developed, (c) devising an evaluation form to use with students, (d) designing an appropriate drawing design.

c. Development stage.

The RTI learning that will be developed and implemented is then evaluated by a learning expert. This expert is able to weigh the validity of the data, instrument items and then each item (item) of the instrument. Essentially, this expert provides validity.

d. Trial and Revision Phase.

Trial and Revision is carried after the design of the learning development model is completed. This collaborative learning media trial was conducted to measure whether this learning media was feasible or not. This phase also determined the extent to which the product was able to achieve the goals and objectives of the development model.

In this research and development, four stages of testing were developed:

1) Expert Judgment.

Expert trials were conducted by content specialists who provided contributions on additional meanings, objectives and input to formative and summative tests carried out. The advice and recommendations of learning design experts is more effective and efficient for instructors. The next expert trial is the media expert test that provides input into the icons to be added in the learning material.

2) One to one test.

This trial was conducted after the data results had been revised to determine the applicability of learning media and its effectiveness and efficiency in the learning process. In each test carried out, results explained the developed product or learning media. Additionally, each trial determined whether the product needed to be revised or not. The decision to conduct a model revision needed to be substantiated as to whether it would be more effective, efficient and attractive for the instructor. This trial involving students sought to find out whether the design of learning media can be implemented correctly by students. The results and limited trials were revised again so that the design of instructional media was ready for small group trials.

3) **Small Group Test.**

This trial sought to determine whether the design of the learning media had been applied correctly and how effective the results of the application of the learning media are towards the achievement of research objectives. Trials were conducted on eight students. The main emphasis of testing focused on the effectiveness, efficiency and attractiveness of the design of learning materials. The results of the draft design improvements were considered in this process.

4) **Field Test.**

This trial focused on whether the developed media design had been implemented correctly and effectively. Trials were conducted on twenty students. The main emphasis of testing focused on the effectiveness, efficiency and attractiveness of the design and used the results of the draft design improvements.

The trials were carried out three times and began with a one-to-one trial which was then revised. Subsequently, small and large group trials were revised again and the results showed that the learning media developed was optimal and ready for validation.

e. Model Validation Phase

The Model Validation Phase carried out in this research and development determined the level of applicability of media. This validation determined whether the learning media developed was truly ready to use without having to be directed or mentored by researchers/media developers. Compared to a model used during conventional learning, it was concluded that the model developed provided greater impact on learners.

Conclusion

Based on the research and development process described in this study, the learning media developed was deemed to be effective in assisting future Master Guides to meet their learning needs. The process of developing instructional media was informed by the model proposed by Dick, Carey and Rowntree that consists of a needs and initial-final analysis, design, development, implementation, and evaluation. The results were considered by learning, material, as well as media and learning design experts to assess the feasibility of the collaborative learning materials. Results show that learning media is collaborative and sits in the good category. With regards to the results of assessment criteria, it can be concluded that learning media assists in the achievement of learning objectives. With regards to the assessment of the effectiveness of instructional media, *pre* and *post-test* results show a significant level of 0.05 t data obtained (7.81), which is greater than t table (2.085). This clearly demonstrates that there is a significant increase in the cognitive abilities of Master Guides after using the available



learning materials. Clearly, learning media that is developed effectively and consultatively meets learning objectives.



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