Mobile Digital Education (MDE) for increasing competence of students based on E-Characters Mental Revolution (E-CMR)

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Abstract. The purpose of this research is to develop a new web-based Mobile Digital Education (MDE) design to measure character education using as an effort to face the era of disruption. E-Character Mental Revolution (E-CMR) Based on Mobile Digital Education (MDE) for Student Competency Improvement in Facing the Disruption. The research method used was a mixed method with the research subject being 80 students in Islamic boarding schools and 80 students in one of the state colleges in Banten, Indonesia of aged 19-22. The scores were analysed using both qualitative and quantitative methods. The results obtained that MDE-based E-CMR can improve the cognitive competence of students in Islamic boarding schools with an N-gain <g> score of 0.74 high categories and improve cognitive competence of students of colleges with an N-gain <g> score of 0.76 high categories. It can be concluded that the MDE-based E-KRM is significant in increasing the competence of students and facing of the disruption.

1. Introduction
Disruption phenomena lead to situations in which changes in the industrial world movement or job competition are no longer linear with available jobs. Some challenges for universities that need to be addressed appropriately are the strengthening of the life of-based community knowledge as a result of Common Effective Preferential Tariffs for the ASEAN Free Trade Area (CEPT-AFTA) [1]. So that the escalation of the development of science is very fast as a manifestation of the demands of education in the development of the character of the Indonesian people [2]. These demands are in line with the target of Education Character Outcome by the government which promotes the National Mental Revolution Movement (GRNM). In principle, GRNM has five main values of character (Nationalism, Integrity, Independence, Mutual Cooperation, and Religion). The essence of Character values is goodness, good thinking, good filling, and good behaving and ICT literacy skills known as 21st century skills. Student Character System Mobile learning experience as rapidly develops of education character [3,4]. Character Education is very important to be trained because the effectiveness of tertiary education is being assessed in terms of the extent to which students acquire the skills they need to work [5,6]. Reasons
for the importance of MDE activities, namely: (1) Mobile Learning positively influences in terms of learning motivation [7,8]. (2) Learning using mobile connects formal-informal thinking skills [9,10].

Mobile Digital Recording is the application of a variety of ways and using a variety of recording tool to obtain information about the extent to which the results of student learning or achievement of competence (circuit capability) learners. Recording answers questions about how well the results or learning achievements of a student. The recording results can be qualitative (narrative statements in words) and quantitative values (in the form of numbers). Measurements relate to the process of finding or determining quantitative values [11]. Mobile recording is an assessment done using mobile (HP) online using the help of the internet and a system. The advantages of online systems are effective recording techniques including projects, portfolios, self-recordings, peer evaluations, and weekly assignments with immediate feedback [12,13].

E-Character Mental Revolution Mental Revolution is defined as an effort to install good habits (habituation) so that students and students are able to behave and act on values that have become their personality. And also character development is carried out by a systematic and integrative approach by involving families, educational units, government, civil society, legislative members, mass media, business, and the world of industry [14]. Character education is education based on core ethical values rooted in a democratic society, in particular, respect, responsibility, trust, justice and honesty, caring, and social virtue and citizenship. From the above understanding it appears that character education refers to the process of planting values, in the form of understandings, procedures for caring for and living those values, and how a student in Islamic (Santri) and student have the opportunity to be able to practice these values in real terms [2].

However, it is seen as important for the development of MDE-based E-Character Mental Revolution (E-KRM) with methods a mixed method research. In this research MDE-based E-KRM System will be developed using operations Web with PHP and MySQL. The formulation of the problem in this applied research is “How is the Development of MDE-Based E-KRM for Strengthening the Competence of Students and Students in Facing the Disruption Age?”

2. Methods

Methods used is a mixed method research. The type of mixed method design chosen in the research was embedded design with the form of embedded experimental one group pre-test and post-test design [15]. The research method used in the research method was mixed with 80 students in Islamic boarding schools and 80 students in state colleges in Banten, Indonesia of aged 19-22. The design scheme is shown in figure 1.

![Figure 1. Embedded experiments design.](image-url)
3. Results and Discussion
Mobile digital education (MDE) trials for increasing competence of students based on e-characters mental revolution (E-CMR) its use is carried out in two models, namely online and offline. Trials Online by means of users being asked to visit the page, then users are expected to learn various things about the eKarakter software then try the demo and fill out the questionnaire. A trial is offline done by giving out information to users and then asked to fill out the questionnaire sheets that have been provided.

3.1. Online
User trial data, namely teacher, is done online on the page http://demo.sirisca.com/ for two weeks. During the two weeks the teacher tried and filled out a questionnaire of 42 teachers, with various locations and institutions. Table 1 results in the average score of character responses.

Table 1. Average score of users online.

| No | Indicator                                           | Average | Category |
|----|-----------------------------------------------------|---------|----------|
| 1  | Ease of system integration                          | 4.2     | B        |
| 2  | Time and energy savings                             | 4.3     | SB       |
| 3  | Availability of access                              | 4.3     | SB       |
| 4  | Ease and simplicity rating                          | 4.6     | SB       |
| 5  | Economic benefits                                   | 4.1     | B        |
|    | **Total Aspects of Effectiveness**                  | **21.5**| SB       |
| 6  | Ease of use                                         | 3.9     | B        |
| 7  | **Total Aspects of Productivity**                   | **3.9** | B        |
| 8  | System reliability                                  | 4.2     | B        |
| 9  | **Total Security Aspects**                          | **4.2** | B        |
| 10 | Beauty of appearance and design                     | 4.1     | B        |
| 11 | Satisfaction in program usage                       | 4.1     | B        |
| 12 | The attractiveness of the program to be reused       | 4.1     | B        |
|    | **Total Aspects of Satisfaction**                   | **12.3**| B        |
|    | **Total**                                           | **41.9**| B        |

Based on table 1. Information obtained that MDE has advantages in saving time and energy, Availability of access and Ease and simplicity of assessment which is reviewed from the aspects of Effectiveness, Productivity and Security with an average of 4.1 good categories.

The page login serves to verify users of http://demo.sirisca.com/ software, only users of software that have been verified are permitted to use available functions according to the user's level in the e-Character software. On the page the login user is asked to enter a username and password in the column provided. Users will be taken on the next page if they succeed through the verification process. If there is an error, the system will give an error message to the user. Figure 2 is the display of the login page in the e-Character software.

Figure 2. Login.
3.2. Home page user level teacher

After the user has been successfully verified by the system, the user will be taken to a page called the dashboard. The functions provided on the home page are according to the user's level. Figure 3 shows the home page for the teacher user level. The page functions are available according to the teacher user level.

Figure 3. Home page of the user teacher.

From the research activities that have been conducted, data obtained on the initial test scores (pretest) and the final test (posttest) about the cognitive learning outcomes of students. Based on the data on the scores pretest and posttest it can be determined the improvement of students' cognitive learning outcomes through the calculation of the average gain score normalized $<g>$.

Figure 4. Shows the average initial test score, the average final test score and the average normalized gain score $<g>$ cognitive learning outcomes achieved by students after the application of a physics-based physics learning model. The average score of the initial cognitive learning outcomes of students before learning is 6.18 from the ideal score of 30. The average final test score of students' cognitive learning after learning is 16.82 of the ideal score of 30. The normalized average score of the gain $<g>$ Student cognitive learning outcomes of 0.74. The normalized gain score $<g>$ is this big if it is confirmed by the category from [16], including in the medium category. This shows that the cognitive learning outcomes of students' competencies.

Figure 4. Bar diagram average initial test scores, average final test scores, and normalized gain average score $<g>$ competency of student concepts for students in Islamic boarding schools.
Improved cognitive learning outcomes of students in each cognitive aspect can be seen from the results of the test scores that obtained by students in each item given in the initial test and the final test which tests the sub concept in question. The number of questions used consists of 30 items all of which are in the form of multiple choices, there are four cognitive aspects included in the concept of Caloric.

Figure 5. Bar diagram average initial test score, average final test score, and normalized gain score average \( <g> \) student concept competence in students of colleges.

Based on figure 5. Information was obtained that the average initial test score, the average final test score and the average normalized gain score \( <g> \) cognitive learning outcomes achieved by students after the implementation of a physics-based learning model applied. The average score of the initial cognitive learning outcomes of students before learning is 7.17 from the ideal score of 30. The average final test score of students' cognitive learning after learning is 18.82 from the ideal score of 30. The normalized average score of the gain \( <g> \) Student cognitive learning outcomes of 0.76.

4. Conclusion
Based on the results of the research it can be concluded that there has been a model of character assessment of students with E-KRM-based MDE using many assessors and assessed based on the attitudes observed by lecturers and teachers. The software produced is-based software web running on a web server and can be accessed using PCs, laptops, tablets, smartphones over internet or intranet networks. The resulting software is considered feasible by system experts to get an average score of 0.46 with very good criteria, (3) the resulting software has been conducteduser trials online for two weeks with a total of 42 teachers. So can be concluded that MDE-based E-KRM is significant in increasing the competence of students and students in facing of the disruption. The recommendation of this research is a system web-based that can be used on all subjects to improve the character of students according to their level of education.

Acknowledgment
The research was funded by research grant research at the Ministry of Research, Technology and Higher Education 2019.

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