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THE EFFECTIVENESS OF DEVELOPMENT OF BRAIN-BASED ARABIC LEARNING MEDIA WITH A NEUROSCIENCE APPROACH TO MUHAMMADIYAH VOCATIONAL HIGH SCHOOL STUDENTS IN THE COVID-19 PERIOD

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Abstract

The problem that occured in SMK Muhammadiyah 3 Yogyakarta is that Arabic cannot be understood well by students due to the conventional techniques and textbook based learning. This study aimed to develop Arabic learning media based on neuroscience in SMK Muhammadiyah 3 Yogyakarta. Neuroscience as the learning media has the goal to improve the students' learning outcomes. The data that were obtained from documents and interview. The results of the classification of reputable National and International journals, as well as interviews, were conducted with 20 students and 2 teachers. The results of the study prove that Arabic learning media which based on neuroscience could improve the students' learning outcomes in learning Arabic with an average score was 77.58/B+. The combination of the attractive learning media and neuroscience theory as an approach that could stimulate students. The analysis of learning media continued based on neuroscience to the stages of product design, development, evaluation to revision, resulting in data that student learning outcomes were well arranged. The weakness of neuroscience as the Arabic learning media was on the results of the students' population data, only a few students did not understand in improving students' Arabic learning outcomes. Therefore, the development of neuroscience as Arabic learning media required further research, the implications of developing Arabic learning media based on neuroscience could provide creativity to teachers and help the students in learning Arabic, especially in SMK Muhammadiyah 3 Yogyakarta.

Keywords: Arabic teaching, Covid-19, media, mufrodat

Introduction

The main problem in this study was that learning Arabic is considered a difficult subject for students in SMK Muhammadiyah 3 Yogyakarta. Therefore, the development of Arabic learning media based on neuroscience is proposed as a means to support students' comprehension. This is primarily because the learning activities have not been carried out effectively, often relying on conventional methods.

Arabic learning has also been perceived as overwhelming by students, due to the lack of active participation in the classroom. Teaching and learning were mainly teacher-centered,

and heavily dependent on textbooks and student worksheets. Students were mostly instructed to write, read, and listen to explanations from the teacher. According to the teacher of the subject, the instructional method still relied on conventional approaches.

The textbook used was published by PWM Educational School and had been in use since the academic year 2021. A preliminary study found that students preferred audio-visual media over textbooks when learning Arabic. In particular, neuroscience-based media were found to support students' thinking skills through brain stimulation approaches, involving both the left and right hemispheres of the brain. This indicates the potential of using neuroscience in Arabic learning media.

Arabic language research has often focused on literature (adab) or curriculum development, while studies that directly address the challenges of Arabic learning remain limited. Some researchers, such as Jailani et al. (2021), have explored the application of neurolinguistic approaches in Arabic learning, particularly in improving students' memory and communication skills.

Previous studies have also emphasized the importance of implementing neurolinguistics in Islamic education settings. For example, Baharuddin et al. (2021) discussed the relevance of neurolinguistics in teaching Arabic morphology (quwaid as-sarfiyyah), while Jailani (2021) demonstrated its potential to enhance vocabulary (mufrodat) learning and conversation practice (muhadatsah) in madrasah settings.

Due to the lack of creative and effective learning media, current practices still rely heavily on conventional techniques (Akmaliyah et al., 2021). Therefore, this research aims to focus on the development of Arabic learning media based on neuroscience to enhance student understanding and learning outcomes.

A preliminary study indicated that students in SMK Muhammadiyah 3 Yogyakarta struggled to understand Arabic materials delivered through traditional instruction. There was also a lack of appropriate media for developing skills in qira'ah, kitabah, istima', and muhadatsah, especially for students who had difficulty reading the Qur'an or recognizing Arabic letters. Arabic instruction in this school primarily used textbooks and worksheets.

Thus, the focus of this study is to develop Arabic learning media based on neuroscience to support students at SMK Muhammadiyah 3 Yogyakarta. The objective of the study is to create effective media that facilitates comprehension, enhances motivation, and improves performance in Arabic, particularly in areas such as mufrodat and muhadatsah. This neuroscience-based learning media is intended to stimulate the brain and synchronize cognitive functions with language learning (Jailani et al., 2021).

Methodology

This research was conducted in SMK Muhammadiyah 3 Yogyakarta, researchers chose SMK Muhammadiyah 3 Yogyakarta as the place of the research because it met the requirements and research criteria. In this study, the research subjects were three teachers and twenty students. From these two research subjects, it is expected to obtain complete data regarding Arabic learning media based on neuroscience in understanding, memorizing, and practicing Arabic *mufrodat* and *muhadasah*. Determination of research subjects is done by sampling the data source. The research analysis was to develop Arabic learning media based on neuroscience.

Moreover, the students in SMK Muhammadiyah 3 Yogyakarta have not been able to understand the material deliverd by the teacher.

The confirmation of this type of research used was R&D (Research and Development) with Borg and Gall model. At the initial planning stage, the researchers used methods and approaches related to primary and secondary data. Primary data were obtained through scientific journals, both National and International journals from Google Scholar. Researchers classified the relevant journal articles, to select and choose those that were suitable as primary data references. The secondary data was obtained in SMK Muhammadiyah 3 Yogyakarta through a questionnaire/questionnaire method, interviews, observation, and documentation guidelines.

The development procedure in this study is based on the procedural steps presented by Borg and Gall which consisted of ten stages. However, at this stage, the researcher only applied five of the 10 stages in this development research. These steps are as follows : 1. Research and initial information gathering stage, 2. Planning stage, 3. Product format development stage, 4. Testing stage with product validation, 5. Product revision stage.

Data collection techniques were carried out by using interview, observation, and documentation methods. First, in-depth interviews were guided by the interview guide. The interview was the primary data in this study. The interview was intended to obtain data by asking questions about everything to informants regarding Arabic learning media based on neuroscience in understanding, memorizing, and practicing Arabic language *mufrodat* and *muhadasah* in SMK Muhammadiyah 3 Yogyakarta. The informants were the teachers and students. Second, observation was conducted to obtain information about Arabic learning media based on neuroscience in SMK Muhammadiyah 3 Yogyakarta. Observations to be carried out are formal or informal. Third, the method of documentation. The documents to be studied are textual data and photos of Arabic learning media in SMK Muhammadiyah 3 Yogyakarta. The textual data were textbooks, student worksheets, educator administration, and learning curriculum related to Arabic learning media. Meanwhile, photo and recording documents provided visual information about the practical activities of Arabic learning media based on neuroscience in SMK Muhammadiyah 3 Yogyakarta.

In this study, the type of data analysis used was Miles and Huberman (1994) model. It was done if the activities in qualitative data analysis were carried out interactively and taken place continuously until complete so that the data was saturated. Activities in data analysis were data reduction, data display, and conclusion drawing/verification data. Three main interrelated activities occur simultaneously, namely: data reduction, data display, and conclusion drawing or data verification. Meanwhile, the test was used to know the effectiveness of test section of student learning outcomes.

Results and Discussion

Findings

Based on the informant's data, SMK Muhammadiyah 3 Yogyakarta is an education that concentrated on the field of skills automatically learning that is emphasized is a practice rather than theory development. The learning process in SMK Muhammadiyah 3 Yogyakarta is based on textbook. Teachers only rely on textbooks in delivering material to student. The following table is the data of Arabic scores in 2020:

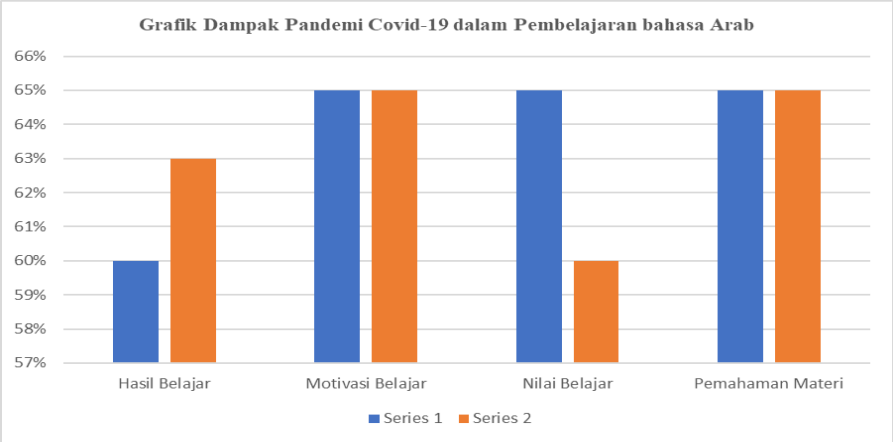
Table. 1: Student Learning Outcomes Before Using Neuroscience Media

No	Learners	Learning outcomes	Scores	Factor
1	HN	Below standard score	65	Not be able to understand the material
2	JR	Below standard score	70	Not be able to understand the material
3	ML	Below standard score	65	Not be able to understand the material
4	SH	Below standard score	70	Not be able to understand the material
5	FQ	Below standard score	65	Not be able to understand the material
6	FZ	Below standard score	70	Not be able to understand the material
7	IN	Below standard score	65	Not be able to understand the material

The table above is a sample of student learning outcomes in the academic year of 2020 through data from the teachers in SMK Muhammadiyah 3 Yogyakarta. The data focused on Grade 10 in computer network engineering major. Of the 20 students, all students had difficulties in learning Arabic before using Arabic learning media based on neuroscience. The result of the interview is as follows:

According to a confession from a student: “Sir, Arabic is pretty difficult to understand and read, especially memorizing and practicing Arabic *mufrodat.* The teacher only told us to write without any other way and alternatives” then, we feel that we are not attracted in learning Arabic in the class, some of our friends can read and write quite well, but cannot practice it.” This is the result of student interviews with researchers. The students experienced the difficulties in understanding the material presented by students.

Graph 1: Impacts of COVID-19 on the Learning Process



COVID-19 has made the teachers and students carried out teaching and learning activities separatedly. On the one hand, there are appeals from the government including maintaining social distance, wearing masks, washing hands, and prohibiting crowds. Teaching and learning activities in the schools had become online. The learning activities are still carried out despite the COVID-19 pandemic. Teachers and students felt difficult and burdened due to online learning activities (Al-Khresheh et al., 2020).

Table 2: Materials validation results

Validator	Maximum score	Rating result	percentage
1	40	46	86%
2	40	45	85%
Total	80	91	87%

The acquisition percentage is 87% which means feasible. It can be concluded that the material in the Arabic learning media developed is very feasible. However, there are some inputs or suggestions given by validators or material experts that it is necessary to add the examples of sentence in *mufrodat* topics (the use of vocabulary) and an evaluation model.

In the media validation instrument, there are 8 points of assessment indicators, namely (1) a simple application display; (2) an attractive appearance; (3) easy to read and having good contrast; (4) navigation buttons work well: (5) well operated audio; (6) easy to use; (7) the application can be used without any problems; (8) application is not error. Each item statement means 1 as the lowest and 5 as the highest score.

Table 3: Media validation results

Validator	Maximum Value	Rating result	Percentage
1	50	48	93%
2	50	47	91.4%
Total	100	95	92.24%

The results of the validation stated that the learning media in Arabic with Arabic learning media based on neuroscience that were developed reached the very feasible criteria with a percentage is about 92.24%. However, there are some suggestions from validators or media experts as a form of optimizing teaching media to increase the font size in Arabic learning media based on neuroscience.

Table 4. Final Results after the use of Media

No.	Students	Media Development Implementation Results	Average score	Likert scale
1	20 students	Test 1	76.2/B+	Results obtained 89 of 1-100
2	20 students	Test 2	80.15/A	90/100 from 1-100

The results of the tabulation above explain that after the use of Arabic learning media based on neuroscience was conducted 7 times, students were given tests to determine student learning outcomes, to find out the improvement of their Arabic ability by using Arabic learning media based on neuroscience. The results of the first test showed that the average test score of students was 76.2/B+ on a scale of 1-100 with a range of score was between 49-89. These results indicated a good interpretation. 20 students were tested in the Arabic learning process.

From the results of the test, it could be concluded that Arabic learning media based on neuroscience can improve student learning outcomes. It was showed by the result that an average score in test 1 (76.02/B+) increased on test 2 with an average score was 80.15/A. It increased 3,13. The average learning outcome of test 2 was 77.58/B+. based on the criteria in the research method, the average B+ (74-78) on a scale of 1-188 is a very good interpretation. Then, the test results had exceeded the number of criteria. In other words, the teaching materials developed can improve student learning outcomes.

Table 5: Improvement of Arabic Learning outcomes after using Arabic learning media based on neuroscience in 2021

No.	Learners	Score	Improved Learning
1	MZ	75	Mastering and memorizing *mufrodat*
2	AG	80	Mastering, writing and *imla'*
3	PP	79	Understanding *muhadasah* easier
4	SM	80	Fluent in speaking *mufrodat*
5	HSD	75	Memorizing *mufrodat*
6	SJ	80	Memorizing *mufrodat*
7	DMY	75	Memorizing *Mufrodat*
8	RU	80	Memorizing *mufrodat*
9	IR	85	Memorizing *Mufrodat* and able to pronounce it.

20 samples of the research were taken to students of SMK Muhammadiyah 3 Yogyakarta who were assisted by Arabic teachers. The students submitted the results of the questionnaire by the concepts and ways of learning expected by students. Students were assisted and facilitated the learning process which related to *muhadasah* material, *mufrodat*, and practice of working on questions and exercises in learning media.

Discussion

Implementation of Arabic Learning Media Based on Neuroscience Development in COVID-19 Outbreak

During the COVID-19 outbreak, Arabic learning activities were disrupted across schools due to the shift to online learning (Shearer, 2020). One of the most critical aspects in education—the interaction between teachers and students—was significantly impacted (Andrews, Walter & Dalyan, 2020).

At SMK Muhammadiyah 3 Yogyakarta, Arabic materials were delivered via digital platforms. Teachers provided subject exercises and attempted to integrate these into online Arabic lessons (Yana et al., 2020). However, the process relied heavily on textbooks, leading to difficulties in student comprehension (Yoyo, 2018).

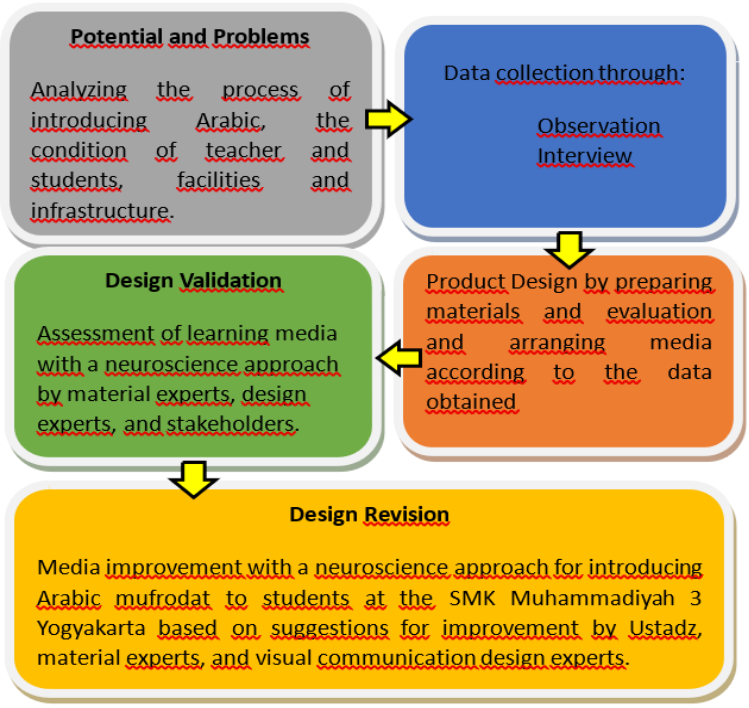
Implications of Development of Arabic Learning Media Based on Neuroscience

Neuroscience is a multidisciplinary field that focuses on the nervous system and cognitive processes, particularly the function of neurons (Jailani et al., 2021; Boudelaa et al., 2010). It also includes the study of brain functions such as the role of the prefrontal cortex in learning (Davis et al., 2020). This part of the brain manages cognitive responses by activating both the left and right hemispheres (Belkacem et al., 2021; Atoum et al., 2019).

In line with technological advancement, Arabic learning media based on neuroscience principles have been introduced. These media aim to enhance student interest and engagement by leveraging how the brain responds to meaningful and focused stimuli (Pesenti et al., 2021; Shalihin et al., 2021; Perkins et al., 2019).

The development process in this study followed five stages: analysis, design, development, evaluation (testing), and revision. Figure 1 provides a detailed overview of the research development stages.

Figure 1: The research stages



The needs analysis involved documentation, observation, and interviews (Zaini et al., 2021). Learning materials were aligned with basic competencies, particularly in vocabulary (*mufrodat*) and speaking (*muhadasah*), applying strategies that stimulate both hemispheres of the brain (Yoyo, 2018).

The Arabic materials were adapted from the official curriculum by the Directorate General of Primary and Secondary Education under Muhammadiyah leadership in Yogyakarta. Teachers presented the content using attractive PowerPoint slides and multimedia-based resources (Pimada et al., 2020; Amrulloh et al., 2021).

The lesson on *asy-syakanu* (residence) involved four core language skills: reading (*qirā'ah*), listening (*istimā'*), writing (*kitābah* and *imlā'*), and speaking (*kalām*), aiming to provide holistic language exposure (Schiller, 2020). In this role, the teacher served as a facilitator who made Arabic more accessible and engaging for learners (Jannah et al., 2018).

The step-by-step approach implemented in the neuroscience-based Arabic learning media is as follows:

1. Students accessed audio-visual content shared by the teacher.
2. Students read the accompanying texts.
3. Students listened to the audio materials.
4. Students focused their mental efforts to form language responses.
5. Students practiced language based on audio-visual cues.
6. The teacher identified students' abilities in vocabulary recognition.
7. Students practiced reading and speaking collaboratively with the teacher.

The primary issue identified at SMK Muhammadiyah 3 Yogyakarta was the limited use of creative and innovative Arabic learning media. Teachers faced challenges in creating

instructional content that was both appealing and effective for students. As a result, students had difficulty understanding the material.

This study offers an alternative approach through Arabic learning media that incorporates neuroscience principles. The model is enjoyable, accessible, and cognitively aligned with brain functions—particularly in activating both the right and left hemispheres—thereby enhancing the effectiveness of Arabic instruction in the context studied.

Conclusion

Based on the findings and discussion, it could be concluded that Arabic learning in SMK Muhammadiyah 3 Yogyakarta is very diverse. The use of Arabic learning media based on neuroscience development can improve the students' learning outcomes by an average score was 77.58/B+ and increased students' motivation. Neuroscience learning media can help the students to understand Arabic material easier. It also facilitated the improvement of students' learning outcomes, including *qiro'ah, kitabah*, *istima' and kalam* as language skills. Students were facilitated by right-brain and left-brain approaches, the brain as potential in optimizing the language understood by students. This research had weaknesses and limitations in the content and substance of the study. The neuroscience media have not been discussed comprehensively. On the other hand, the media that was applied such as the material and visualization still needed improvement. Therefore, input and contributions were necessary. The importance of this research was followed up to obtain relevant research results in the future in the scientific aspect of Arabic language education. The researcher recommended more examples of Arabic learning media such as Ibn Sina's multilevel reasoning approach, Arabic learning media based on science and the Qur'an and Arabic learning media based on neuroscience during the COVID-19 outbreak. Hopefully, it will the positive contribution for the development of Arabic learning in the future.

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