

The use of neuroscience in developing Arabic learning media: Its implications in vocational high schools

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Abstract

The purpose of this study was to develop neuroscience-based learning media at SMK Muhammadiyah 3 Yogyakarta. The research approach used in this research is research and development (R&D). The research subjects were teachers and students. Data collection was carried out by using interviews, observation, and documentation methods. The validity of this research data using triangulation. Data analysis used the Miles and Huberman model, namely data reduction, data display, and conclusion drawing/verification data. The results of this study prove that learning media is very effectively used to improve student learning outcomes. Based on the results, it can be concluded that the material brain-based learning media is considered very feasible to be applied in Arabic teaching and learning activities. In addition, this learning media is considered effective to be implemented in the process of learning Arabic *mufrodat* and *muhadasah*.

Keywords: Arabic; mufrodat; muhadasah; neuroscience; teaching media.

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1. Introduction

Learning Arabic consists of various linguistic aspects which include grammar, reading, writing, and translating. This aspect that must be mastered cannot be separated from the position of Arabic in Indonesia as a foreign language. For the Arabic learning or any other language learning process to be carried out properly, proper learning facilities and a supportive environment are needed for habituation and proficiency in the language (Kohl et al., 2019).

However, in reality, teaching Arabic is difficult for students to understand at school. Students have not been able to respond well, to *mufrodat* material and *muhadasah* material presented by the teacher. This not only happened in one study but also happened frequently and was discussed in previous studies. Therefore, the main importance of research in this study is the difficulty of students in understanding and mastering Arabic learning materials. Good material related to learning to write, read, memorize vocabulary (*mufrodat*), and practice speaking and conversation (*muhadasah*). In line with the preliminary study, the researchers found problems related to learning media. Through questionnaires, students need more Arabic learning media. Because so far the learning implemented at SMK Muhammadiyah 3 Yogyakarta has focused on module-based learning. Using media to teach or learn languages affects the rate by which students assimilates; as digital literacy is a factor (Duek & Nilsberth 2022; Alsubaie, 2022). It affects the low learning outcomes of students. Arabic is one of the local content subjects required by the Ministry of Religion, General of Islamic Education, and is one of the graduation requirements required by the Directorate General of Primary and Secondary Education for Muhammadiyah Regional Leadership in Yogyakarta City. However, the application in the implementation of learning is not of interest to students. Lack of motivation to understand Arabic material (Shearer, 2018). There is no intensive assistance that focuses on students with effective Arabic learning media (Akzam et al., 2021).

So far, many studies on Arabic learning have discussed the development of learners' module-based Arabic teaching and learning with conventional techniques (Malkawi, 2020). Teachers are more directed to students only to explain, read, and write without providing alternative effective learning strategies to students (Suyadi et al., 2020a). The literature found in Ahmad 2020's research, in his research examining the ineffectiveness of conventional learning techniques which are seen by students in monotonous and boring classes (Xuan et al., 2020). The second similar study was reviewed by Fauzi (2020), in his research he stated that the use of neuroscience in Arabic Curriculum Development Design, this research is more directed to the use of neuroscience in the development of the Arabic language education curriculum in line with the problems that in the article, the functional use of the brain can affect the performance of reason and the design of the teacher's thinking in implementing the Arabic curriculum (Fauzi 2020). It ends with the findings of Nurul 2020's research, that the learning process uses the lecture method, some students do not focus on learning, and students feel bored because teachers only use projectors, PowerPoint slides, and blackboards (Suyadi & Widodo, 2019).

Thus, based on previous research references, there has been no research that has raised the development of neuroscience-based learning media. Neuroscience-based Arabic learning media implemented at SMK Muhammadiyah 3 Yogyakarta. Considering the literature facts and social facts from this study, the researcher assumes that the position of the researcher in this study is to be a novelty to previous research. Novelty in this study is relevant as a follow-up to previous research. To get new findings in the research base, which are related to Arabic language learning media. The novelty in this research can be said to be a follow-up to Fauzi's 2020 research, namely the use of neuroscience in the design of Arabic Curriculum Development. However, in Fauzi's research, neuroscience focuses on the use of Arabic curriculum development. Fauzi conveyed in his research results that neuroscience is a design for developing an Arabic language learning curriculum. the focus of Fauzi's research, because students need to stimulate their brains with motivation, right brain and

left-brain stimulation, as well as curriculum substance that is still relevant to neuroscience subjects. In this study, neuroscience is intended as an implication as well as an alternative to developing Arabic learning media at SMK Muhammadiyah 3 Yogyakarta.

The research objective is to develop neuroscience-based Arabic learning media at SMK Muhammadiyah 3 Yogyakarta. The research process starts from the beginning of the new academic year 2021/2022 at the beginning of February. The reason for choosing SMK Muhammadiyah 3 Yogyakarta as the location (setting) for research, is to find out the implementation of neuroscience-based Arabic learning media development. The research subjects were 20 students of class X (ten) TKJ (Abu-Remaileh, 2021). Researchers gave questionnaires to students related to neuroscience-based learning media. The effectiveness of this media can help the process of learning Arabic in SMK Muhammadiyah 3 Yogyakarta. The benefits of neuroscience media make it easy to learn Arabic (Zainuddin et al., 2020). Motivating students in learning, growing talents, emotions and interests of students (Alqahtani & Alothaim 2022). Because it answers the problems that have occurred so far at SMK Muhammadiyah 3 Yogyakarta. Information from students, students have not been able to memorize *mufrodat* and launch the practice of *muhadasah*. Likewise, information from the teacher that the teaching and learning process so far has not run optimally, because students have not mastered Arabic well (Ritonga et al., 2021).

The findings of this study will be explored in narrative form in the results and discussion section of this study. Explicitly in this study, the researcher described the implementation of the development of neuroscience-based Arabic learning media, because it made it easier for students to learn, understand the material, memorize *mufrodat*, and practice *muhadasah*. Provide new benefits for students, among others: improving student outcomes and improving the skills of *qiro'ah*, *kitabah*, and *kalam*.

1.1. Literature review

Taxonomy of education as a framework for the area of human personality, namely forming attitudes (affective domain), developing knowledge (cognitive domain), and training skills (psychomotor domain), does not seem to be a complete domain at the level of educational outcomes (Verawati & Hasanah, 2021). Even in practice, the cognitive domain is more important than the other domains. As if the human personality is only related to the intelligence of the brain, which was later known as IQ. Yang someone with a high IQ is not guaranteed to be able to overcome various problems unless he has other high intelligence tools (Huneety et al., 2020).

Learning is a process of communication between teachers and students in an environment. The learning process is composed of components that are inseparable, complementary, and continuous (Alhirtani, 2019). These components consist of curriculum, teachers, students, learning methods, learning materials, and evaluation tools. Therefore, good planning and management are needed so that each component can function properly.

1.1.1. Fun and Easy Learning Media

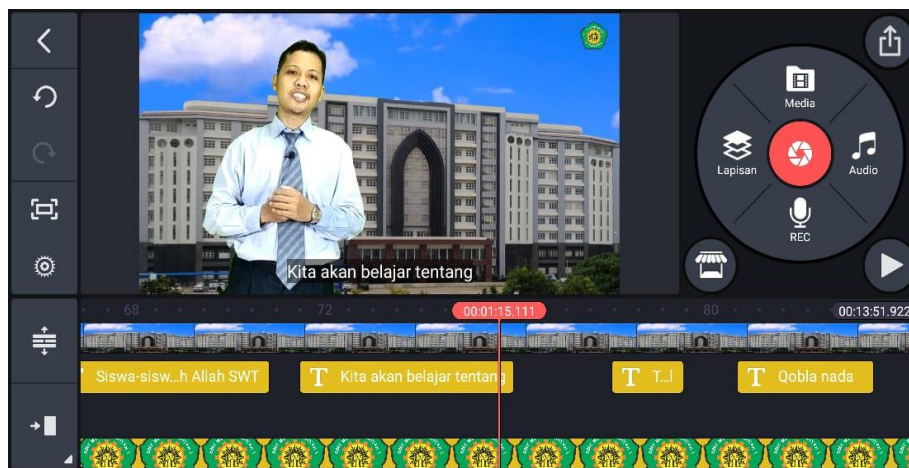
The success of a learning process can be marked by the acquisition of knowledge, skills, and positive attitude changes in each individual. For success in this teaching to be obtained, requires several supporting factors that must be maintained by an educator. A conducive classroom atmosphere will certainly make students more interested and actively participate in the learning process (Albantani & Madkur, 2017). One effort to create a conducive atmosphere is to use learning media.

At first, the term media was known as teaching aids, then it became audiovisual aids (visual or hearing aids), then became instructional material (learning material), and now it has become instructional media (educational media or learning media). Along with the times, it is now known as learning media, also known as e-learning, which means internet-based online learning media

(Akmaliyah et al., 2021). According to Michael Purwadi, electronic devices used in e-learning are electronic devices related to information and communication technology (ICT), as well as multimedia in the form of CD Room, radio tape, television, and radio.

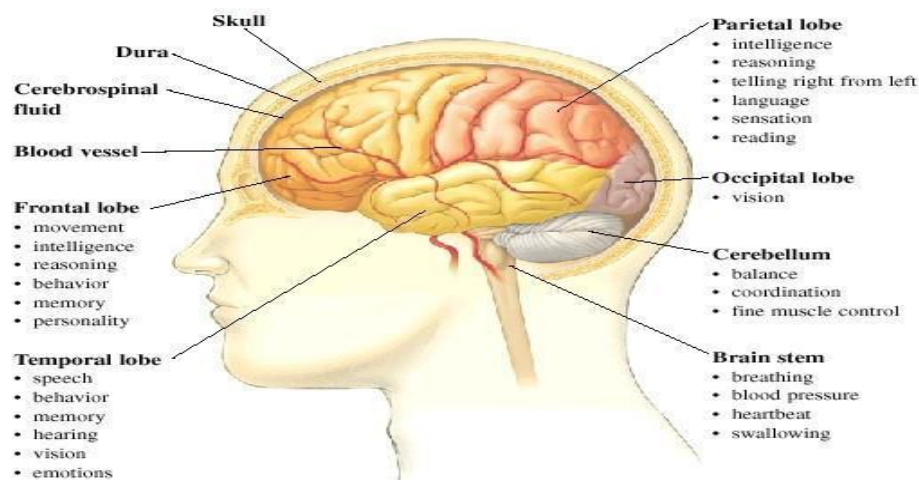
According to Jensen Brain-Based Learning is a model that considers how the brain learns optimally. The optimization is meant not by forcing the brain to accept as much learning as possible but by letting the brain learn and work according to its rhythm (Munir & Nur, 2018). This is in line with what was stated by Duman (2006) that brain-based learning is student-centered learning that uses all parts of the brain and recognizes that not all students learn the same way (Abu Bakr Siddiq, 2020). Brain-based learning is also an active process in which students play an active role in building their knowledge of various learning situations (Kurniawan et al., 2021). Figure 1 is an image of brain-based learning-based audio-visual media:

Figure 1
Learning Media



Discussing the Arabic language learning media juxtaposed with neuroscience this science is a science that studies the understanding of the brain and parts of the human brain (Al-Khresheh et al., 2020). The main goal of neuroscience is to study the biological underpinnings of every behavior (Al Zumor, 2019). That is, the main task of neuroscience is to explain human behavior from the point of view of the activities that occur in the brain (Desfa, Suyadi, Hendro, & Asyraf, 2020). Recent research in the field of neuroscience has found some evidence of an inseparable relationship between the brain and human behavior (Figure 2) (Jailani et al., 2021b).

Figure 2
Neuroscience.



Through the Positron Emission Tomography (PET) instrument, it is known that six brain systems regulate all human behavior (Taufiqurrochman et al., 2020). The six brain systems are the prefrontal cortex, limbic system, cingulate gyrus, basal ganglia, temporal lobes, and cerebrum (Iljina et al., 2017). Just an example of researchers from neuroscience studies that are specific and focused on researchers in neuroscience, students are directed and trained in the right brain, left brain, and midbrain approaches (Mohammadipur, 2018).

Learning outcomes are self-assessments for students, as well as changes that can be observed, proven, and measurable in the abilities or achievements experienced by students as a result of their learning experiences (Chair et al., 2020). Ibrahim explained that learning outcomes are the level of success of students in studying subject matter at school which is expressed in the form of scores (values) (Wargadinata, 2020).

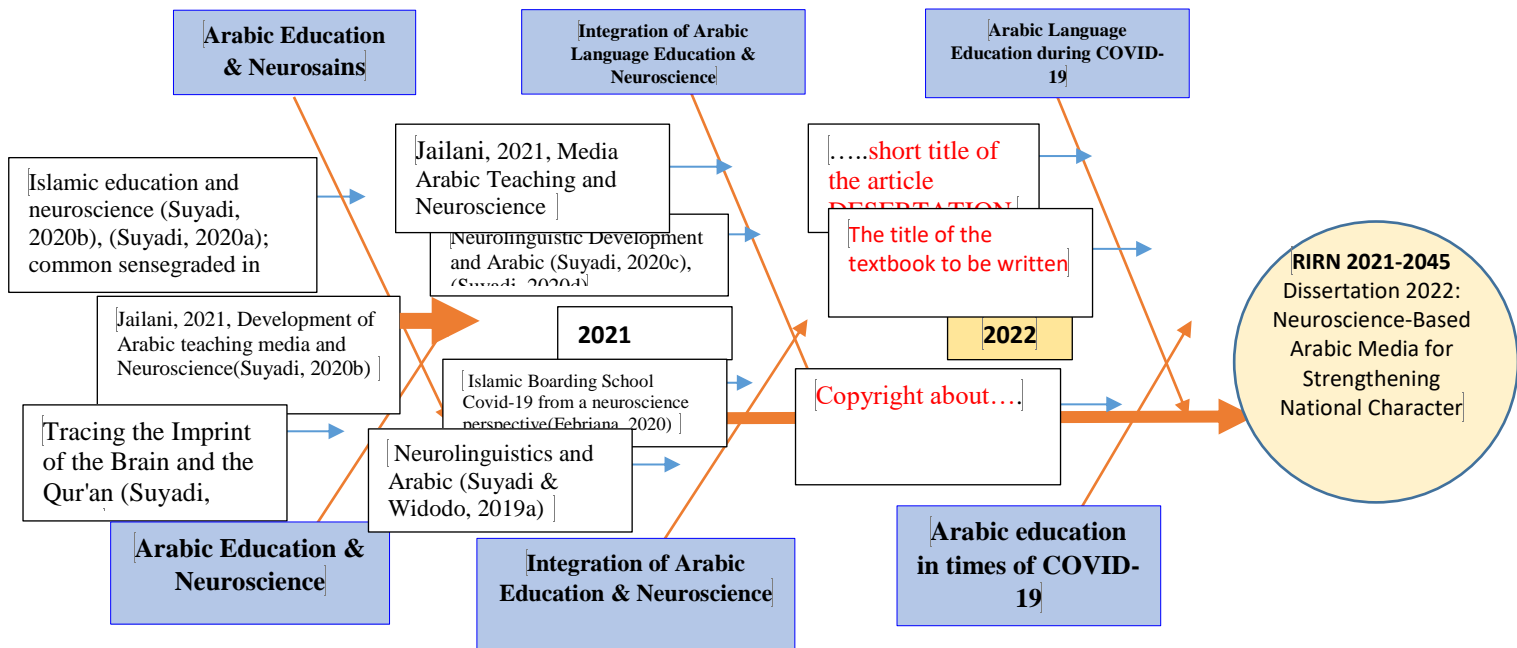
In Bloom's taxonomy, changes in student learning outcomes cover three domains, namely (1) cognitive or thinking skills, (2) effective or attitude (3) psychomotor skills. Therefore, students are said to have succeeded in learning if there has been a change in at least one of these aspects (Belkacem & Lakas, 2021). So basically learning outcomes are changes in student behavior for the better.

1.2. Related research

Researchers have conducted a lot of research that is very relevant to the theme of this research from 2021 until now. In 2021-2022, researchers have conducted research and publications, some of which are student admissions and Neuroscience (Jailani et al., 2021), (Jailani et al., 2021c), Implementation of Arabic Media and Neuroscience Jailani & Widodo, (2021); Jailani & Suyadi, (2021a), Development of Arabic media and brain-based learning (Jailani, 2021a), neurolinguistic learning and Arabic teaching in madrasas Jailani et al., (2021d); Suyadi & Widodo, (2019), neurolinguistic development in SMK (Jailani et al., (2021e); Jailani & Perawironegoro (2021), and so forth. All of these studies were published in accredited National journals Sinta 1 and Sinta 2. In 2021, researchers conducted research and publications on the use of neuroscience media and its effectiveness during the COVID-19 period. The neuroscience perspective submitted is still in "In Process" status in reputable international journals indexed by Scopus., namely JIIF (Jurnal Ilmiah Islam Future): is the output of the Kemenristek Dikti 2021 talent innovation research. Still in the same year, researchers also succeeded in submitting research on the relevance of reason and neuroscience in salman's interpretation which was sent to a reputable international journal indexed by Scopus Q2, namely (Global Journal Al taqafah) with the status "In Review with certainty".

In 2022, the researcher has also conducted research and publications on the interpretation of salam and neuroscience with implications for the brain and aql Jailani, (2021c); Jailani et al., (2022); Mauli et al., (2021) and neuroscience studies by learning Arabic in Islamic boarding schools (Jailani, 2022; Jailani et al., 2021f; Jailani & Suyadi, 2020c; Reality et al., 2021). The researchers also have intellectual property rights and community service Suyadi et al., (2021); Jailani et al., (2021f); Jailani et al., (2021a, & 2021g). In the same year the researcher also conducted cross-concentration research in the field of Islamic studies (Jailani, 2021b), (Jailani et al., 2022b; Jailani & Suyadi, 2021a & 2021b; Reality et al., 2021). Thus, the researchers have a very strong track record of conducting and completing this research. The following is an image of this researcher's roadmap (figure 3):

Figure 3
Research Roadmap

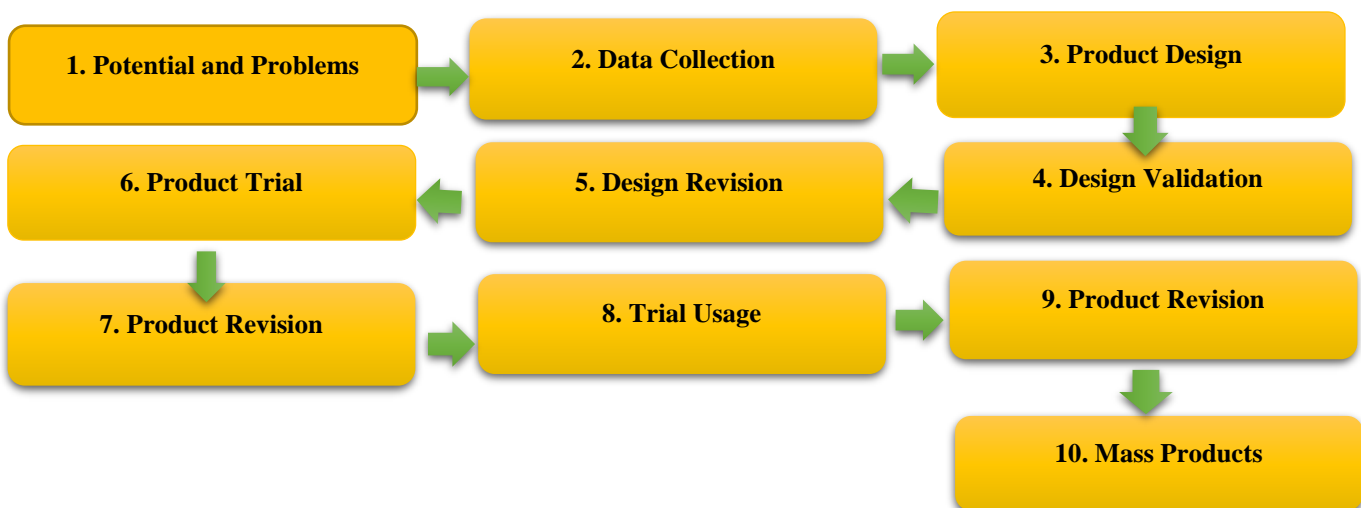


2. Materials and Method

This research approach is a qualitative type of Research and Development (R & D) Borg & Gall. Model (Gall, 1989). The reason for choosing R & D is because they want to produce neuroscience-based Arabic learning media products. The procedure used in this study is based on the steps presented by Borg and Gall which consists of 10 stages (Esmaili, 2021), including 1. Initial research and information gathering stage, 2. Planning stage, 3. Initial product format development stage, 4. Initial trial stage with product validation, 5. Product revision stage, 6 field trial stages, 7. Product revision stage II, 8, field trial stage, 9. Final product revision stage, 10 Mass Products (Sugiyono, 2017).

Figure 4 is a picture of the Bord & Gall development model consisting of 10 development steps, which can be seen as follows:

Figure 4
Research Steps Research and Development Methods.



2.1. Participants

The subjects of this study were students of class X at SMK Muhamadiyah Yogyakarta and Arabic teachers. Researchers took the object or research setting consisting of SMK Muhammadiyah 3 Yogyakarta. All participants voluntarily participated in this study. This study posed no harm to the participants, institutions or the environment involved.

2.2. Data collection instrument

Data was obtained through in-depth interviews, observation, and documentation methods. To collect data, using observation to obtain data on the objective conditions of the Arabic learning process, a questionnaire was used to obtain data on the needs analysis of neuroscience-based Arabic learning media Saibah & Suyadi (2020), objective conditions Creswell's (2018), analysis of media indicators and media feasibility, interviews to collect data by asking questions to teachers and students to obtain data on student characteristics, materials taught, media used in schools, and documentation to obtain data related to research objects and activities supported in the process. learning, objectives, indicators, materials, methods, media, and evaluation (Das, 2021).

2.3. Data analysis

The data analysis technique followed Miles and Huberman, a closed questionnaire using *the Likert scale*, and the questionnaire data from the needs analysis was analyzed using a measurement *accelerating scale*. The data analysis techniques are interviews, observations, and documentation through data *reduction*, data *displays*, and *verification* (Jamal and Hala 2021). Next, analyze the effectiveness of the media by performing normality, homogeneity, and independent T-test tests.

2.3.1. Targeted Achievement Indicators

Table 1 displays Targeted Achievement Indicators.

Table 1
Performance Indicator

No	Outer Type	Achievement Indicator
Mandatory Outcome		
1.	Dissertation	Finish/ Minutes of exam
2.	Indonesian Journal of Applied Linguistics (IJAL) (Q2)	Publish
Additional Output		
3.	Copyright of the ISBN textbook with the title "Tafakkur Method in Neuroscience-Based Arabic Learning Media", published by UAD Press, a member of IKPI	Publish

2.4. Research Settings

This research activity was conducted at SMK Muhammadiyah 3 Yogyakarta. The reason for choosing the object of research at SMK Muhammadiyah 3 Yogyakarta, is because it meets the requirements of this study. Namely to develop neuroscience-based Arabic learning media. With the argument, students need to be given a solution related to the decline in Arabic learning outcomes. Furthermore, the duties, roles, and responsibilities of researchers are described in Table 2.

Table 2
The Role of Researchers

No	Researcher	Task
1.	Mohammad Jailani	1. Determine the specific theme of the dissertation research that is in line with

		<p>the dissertation supervisor's research roadmap.</p> <ol style="list-style-type: none"> 2. Formulate a dissertation research roadmap. 3. Always consult and guide dissertation proposals 4. Guidance and assistance to lecturers/dissertation guidance. 5. Material and media validation of the dissertation research model design. 6. Prepare a dissertation proposal progress report. 7. Dissertation manuscript clinic. 8. <i>fine-tuning</i> or improving the quality of dissertation research articles. 9. Submitting articles as the corresponding author to the journal (IJAL) (Sinta 1 and indexed by Scopus Q2) with the lecturer as the first author. 10. Formulate the title of the dissertation research which is in line with the research road map of the supervisor. 11. Prepare a dissertation proposal according to the direction of the supervisor. 12. Make a summary of the master's thesis proposal and input the keyword. 13. Improve the quality of proposals. 14. Conduct research according to the dissertation procedure that has been approved by the supervisor. 15. Collect research data. 16. Designing a research model. 17. Perform alpha test and beta test. 18. Perform data analysis on alpha and beta test results. 19. Create a blueprint model for dissertation research findings. 20. Drafting published articles in the Sinta 1 journal and indexed by Scopus according to the JIIF journal template.
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		21. Follow the article clinic before submitting it to the Ilmiah Islam Future Journal.
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3. Results

3.1. Learning Media Validation

The validation process included 2 material expert validators and 2 media expert validators from Universitas Ahmad Dahlan Yogyakarta. In the material validation instrument, there are 5 assessment indicators, namely (1) Ease of using the media (2) the media generates student learning outcomes (3) according to student characteristics (4) the material presented is easy to understand (5) the use of language appropriate to the age of student development. Material Expert 1 was rated by an expert in Arabic education and teaching Arabic in media development. Material Expert 2 was assessed by Asep Setiawan S.Pd.I, as a practicing educator or Arabic teacher at SMK Muhammadiyah 3 Yogyakarta.

Table 3

The results of the validity of Material Experts 1 and Material Experts 2

No	Aspect	Material Expert I					Material Expert II				
		1	2	3	4	5	1	2	3	4	5
Serving Aspect											
1.	Ease of using media					√					√
2.	Learning media arouses students' interest in learning					√					√
3.	According to student characteristics					√					√
4.	The material presented is easy to understand					√					√
5.	Use of language appropriate to the developmental age of students					√					√
	Amount					25					25
	Total value					25					25
	Average					5.0					5.0
	Category					Very good					Very good

Based on Table 3 above, the results of the assessment of the two Material Experts on neuroscience media products gave a very good assessment with a score of 5.0 by Media Expert I and 5.0 by Media Expert II. This shows that the two Material Experts assessed that from the aspect of the video presentation, it was good and by the guidelines that were used as references.

The description of the results of the material experts I and II material experts are as follows:

Material Expert I

In the aspect of the presentation, Material Expert I gave a score of 5 on the indicator of ease of use of media, video media aroused student interest in learning, according to student characteristics, and the material presented was easy to understand. A score of 4 was obtained for the indicator of using language according to the developmental age of students.

Material Expert II

In the aspect of the presentation, Material Expert II gave a score of 5 on all indicators, namely the ease of using media, learning media to improve student learning outcomes, according to student characteristics, and the material presented was easy to understand, and the use of language appropriate to the age of student development.

3.1.1. Validation of Media Expert 1 and Media Expert 2

The media expert validation consisted of 2 media experts. The first media expert was assessed by Dr. Md. Lailan Arqam, M.Pd, a lecturer who teaches educational technology and learning innovation, while the second media expert was assessed by Agus Yuli Saputro, S.Kom, as a computer and network engineering teacher at SMK Muhammadiyah 3 Yogyakarta. In media validation, there are 6 assessment criteria, namely (1) clear and interesting text (2) animation according to the age of students (3) attractive images (4) size of images and writing (5) attractive background (6) color selection according to the theme

Table 4

Media Expert Assessment Results Data from the Appearance Aspect

No	Aspect	Media Expert I					Media Expert II				
		1	2	3	4	5	1	2	3	4	5
Appearance											
1.	Clear and attractive text					√					√
2.	Animation according to the age of the student				√						√
3.	Interesting pictures					√					√
4.	Image and text size					√			√		
5.	<i>background</i> interesting					√					√
6.	Color selection according to the theme					√					√
	Amount				4	25			6	16	
	Total value				29				22		
	Average				4.83				3.66		
	Category				Very good				Very good		

The results of the assessments of two media experts based on Table 4 on neuroscience learning media products were obtained in a good category with scores of 4.83 and 3.66, respectively. This shows that the two media experts judged that the video display was good and by the guidelines that became the reference.

The description of the results of the Media Expert I and Media Expert II assessments on the display aspect is as follows:

Media Expert I

A score of 5 on this display aspect is found in the attractive image indicator. A score of 4 is given for the animated indicators according to the age of the students, the size of the pictures and text, and the selection of colors according to the theme.

Media Expert II

A score of 4 was obtained on the animation indicators according to the age of the students, interesting pictures, interesting backgrounds, and color selection according to the theme.

3.2. Student Learning Improvement Results

Based on the results of research at SMK Muhammadiyah 3 Yogyakarta, the researcher tabulates students who can respond to and understand Arabic learning in *muhadasah*, *quwaidul 'arobiyah* materials including *kitabah*, *qiro'ah*, *istimaah*, and *kalam*, using Neurosians-based Arabic learning media, as in table 5 below:

Table 5
Sample of Learners Familiar with Arabic Language Subjects

No	Department of TKJ Class X TKJ 1	Results/ Understand	
		Male	female
1	M Z	Understand	
2	A G		Understand
3	P B S	Understand	
4	S M		Understand
5	H S D		Understand
6	S J		Understand
7	D M Y		Understand
8	R U H		Understand
9	Y A P	Understand	Understand
10	M W S	Understand	Understand
11	Y D D	Understand	
12	R A P	Understand	
13	A A M	Understand	
14	N D M	Understand	
15	D A R	Understand	
16	A T	Do not understand	
17	D A M	Do not understand	
18	K N A		Do not understand
19	M E A	Do not understand	
20	M T B	Do not understand	

Based on the results of the tabulation of students above, it is explained that students better understand Arabic learning or the teaching and learning process in the classroom. Responding to the easy practice of *muhadasah* because researchers are more directing students in *muhadasah* material by adjusting their brain development abilities (Research Questionnaire for Preliminary Study of Arabic Learning, 2021). So from 20 students in class X (ten), TKJ 1 some students are still weak in memorizing mufrodad material, from the fact that students can understand and follow the learning and so on. Thus, the trial of the Neuroscience-based Arabic learning model helps make it easier for students to learn Arabic.

3.3. Implementation of Arabic Learning Media

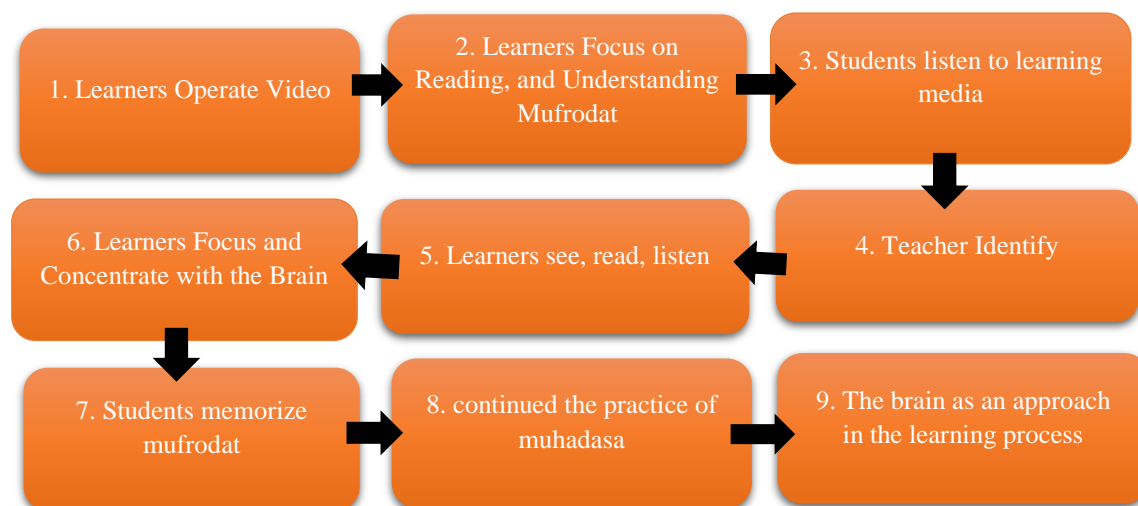
Researchers took research samples in class X (ten) TKJ 3, there were 20 students, as in line with the preliminary study questionnaire. Related *implementation of* neuroscience-based Arabic learning media at SMK Muhammadiyah 3 Yogyakarta. namely adjusting the material in the chapter on Arabic subjects. The material that had previously been conceptualized as best as possible by the teacher, adjusted the basic competencies and learning indicators. Learning materials are sourced from Arabic books that are relevant to Arabic learning, one of which is an Arabic book published by the Directorate General of Primary and Secondary Education for Muhammadiyah Regional Leaders, Yogyakarta City (Masrai, 2020). Arabic learning media has been packaged very attractively with

modifications *audiovisual* the good one. The material adapts to the chapters in the Arabic language book and adjusts the students' abilities in learning Arabic (Shearer, 2020).

The steps for neuroscience-based Arabic learning media are as follows (Figure 5):

Figure 5

Step Flow of Neuroscience-Based Arabic Learning Media



The steps in neuroscience-based Arabic learning media are as follows:

1. Students operate the audio-visual video that has been given (shared) by the teacher.
2. Students see the readings delivered by the teacher in the media
3. Students listen well to the audio-visual material *mufrodāt* and *muhadasah*
4. Learners concentrate on the brain and respond to the language to be spoken
5. Students see, read, listen, and practice what the teacher says in the media.
6. The teacher identifies students who cannot read and students who can read Arabic *mufrodāt*.
7. Students are directed to memorize five *mufrodāt* and asked to practice saying them, according to the *mufrodāt* material.
8. Followed by students practicing *muhadasah* with their classmates.
9. Right brain and left brain as approaches in learning Arabic, neuroscience-based Arabic learning media

Above are the steps for implementing neuroscience media in students. Beginning with the students being directed and going through an audio-visual video instructor that has been given by the teacher, to be informed to students. The use of this media is carried out during the COVID-19 pandemic or the face-to-face offline period. This is done so that the utilization of this use is effective. The media has been equipped with *mufrodāt* or *muhadasah* material that has been packaged according to the standard size of student learning in KIKD. The use of media is directed at students with a brain approach related to cognitive, affective, and psychomotor mastery. Which aims to improve students' ability to read, and practice *muhadasah* at the end of the lesson.

The teacher identifies students by dividing students between students who cannot read Arabic and those who can not Swa was qualified and mastered Arabic. the classification is divided into three parts, firstly students who can read well, secondly, students who master standard Arabic material, and finally students who cannot read Arabic. The division of students is not perfect if students do not continue to memorize every 5 vocabulary words. Continuing, students are directed to carry out the practice of the *mufrodāt* that has been memorized, and perfected by the practice of *muhadasah* or conversing with their seatmates (friends beside them). In closing, this media focuses on the right-brain and left-brain approaches.

3.4. Development of Brain-Based Learning Media- Potential and Problem Analysis

This research activity was conducted at SMK Muhammadiyah 3 Yogyakarta. The reason for choosing the object of research at SMK Muhammadiyah 3 Yogyakarta, is because it meets the requirements of the research. Namely to develop from the implementation of audio-visual-based Arabic learning media. The reason is that students need to be supported and look for alternatives related to the lack of interest in learning Arabic, and the decline in Arabic learning outcomes. This research was started in February 2021 in a preliminary research study. As the output of the research output of the researcher's thesis, the researcher conducted by giving questionnaires to students with 20 students as the subject. The following is a description of the learning media questionnaire

3.5. Media Development Flow- Audio Recording and Media Visualization

The process of audio recording and visualization of Arabic learning media is carried out at Muhammadiyah Vocational School. By using a *green screen*(green screen) the background of the media attracts students' sympathy. For image quality (visualization) use Kinemaster, Remove bg, and Adobe Premiere software. As for improving and clarifying the sound (audio) use a microphone in audio recording so that students concentrate when listening to audio-visual media explanations.

Figure 6

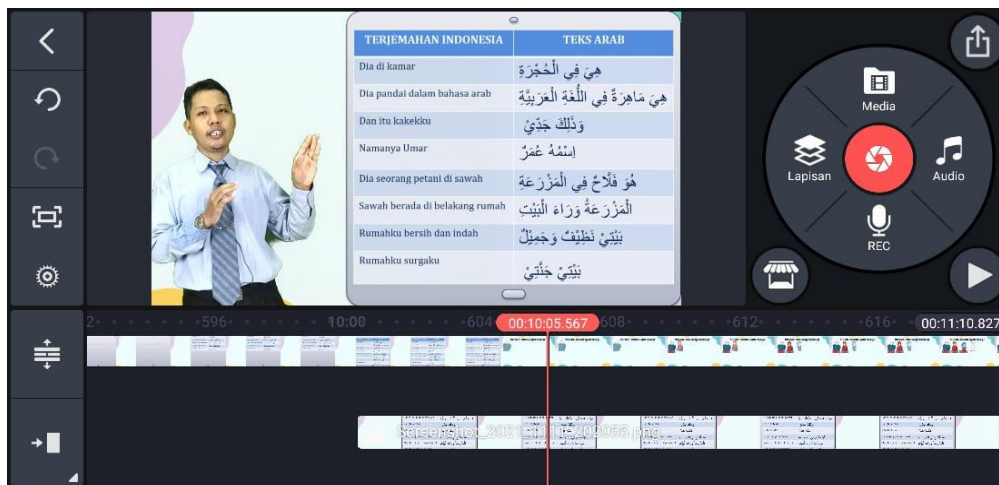
Filming process with a green screen



The figure 6 above is a filming process to produce audio-visual-based Arabic learning media. The shooting process aims to explain the material contained in the learning media. Which contains *mufrodah* and *muhadasah* material. The above researcher is also a teacher who acts as an actor in audio-visual media. The additional filming process in this media is different from previous research that has been studied by Kharisma (2020).

Figure 7

The teacher explains the mufrodats in the Kinemaster application



The editing process in Figure 7 is an audio-visual recording in the form of a teacher's explanation explaining the *mufrodats* contained in audio-visual-based Arabic learning media materials. The audio-visual display is to attract the sympathy of students in learning the Arabic language. *Mufrodats* in material 1 there are 10 *mufrodats*. but the teacher gives explanations and attention to students with only five *mufrodats* which are directed to students.

Figure 8

The intro display visualized by the teacher

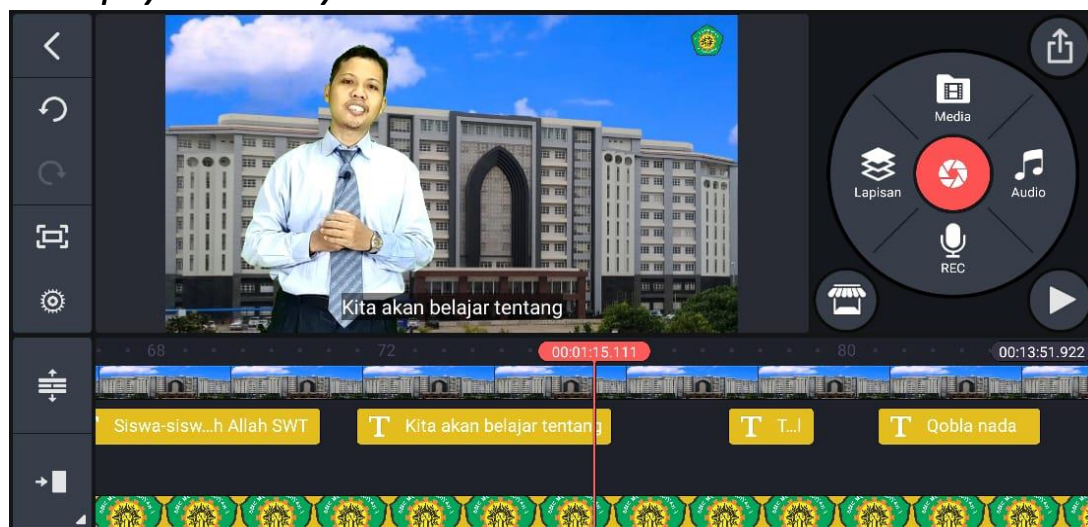


Figure 8 above is the first display of delivering *mufrodats* and *muhadasah* material in audio-visual-based Arabic learning media. The picture above shows that it is different from the visualization of learning videos examined by previous research. And relevant to the learning media issued by the development of today's Arabic education curriculum. Visualization of audio-visual-based Arabic learning media adjusts the input and expectations of teachers and students at SMK Muhammadiyah 3 Yogyakarta.

3.6. Initial Appearance and Content of Media Material

Figure 9

Initial view a



In Figure 9 above, it is the opening of learning media that is not opened by the teacher actor, to open the teaching of Arabic language material. It begins with greetings, reading prayers, asking for news, and opening the opening in Arabic. Examples of opening words and greetings conveyed by the teacher are "*bismillahirrahmanirrohim assalamu'alaikum werahmatullahi wabarokatuh. Ahlan wa sahlan wa marhaban bikum ayuuha ttullab. Al-Izza'. Fi muhadorotina alyaum. Fi maddah alla muhadasa. Fi hadzasshobah almubarak.' ah assyabiah sobhan. Fittauqit al indunsiya wa yukyakarta*". The opening words above if translated into a sentence like this, "*bismilhirrohmanirohim assalamu'alaikum warahmatullahi wabaraokatuh. Welcome, my happy students. In our meeting today. We learn about muhadasah. On the occasion of this very bright and blessed morning. At seven o'clock in the morning Western Indonesia time according to the city of Yogyakarta*".

The sentence above is related to Figure 9, the opening sentence that is often used by teachers in greeting students in learning media. The goal is that students are provoked and stimulated in their brains to be more active in conveying and practicing Arabic. As a warm-up before learning begins, the teacher usually opens with a pleasant and happy opening.

Figure 10

The initial view of prayer b.



The teacher opens by praying first to start *mufrodah* or *muhadasah* learning. Prayers are said as shown in Figure 10, with students in class. Which aims to make learning useful and run smoothly. On the other hand, students get used to praying to Allah in every activity and work they start. This is

also to the provisions of the recommended Arabic curriculum issued by the Ministry of Religion and Education of PWM DIY, one of the indicators is that students are directed to pray before the lesson begins.

Figure 11

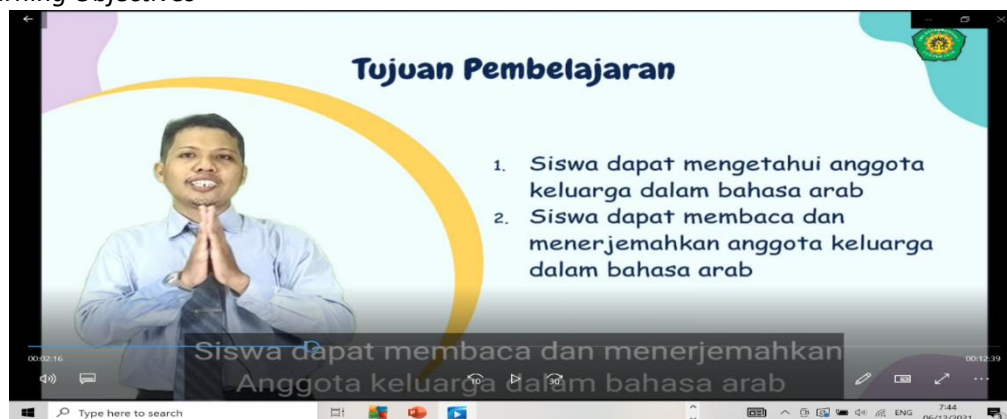
Initial Display of "assyakanu"



The description of the initial display material above is a lesson conveyed by the teacher to students (Figure 11). The chapter on residence (*assyakanu*). Students are taught about *maharah qiro'ah* good reading, *maharah istima'* good listening, *maharah kitabah* writing correctly and *imla'*, and finally expected to be able to practice by speaking *maharah kalam*. Of course, in this media, the teacher acts as a facilitator and makes it easier for students to learn Arabic.

Figure 12

Learning Objectives



Learning Objectives taught to students consist of 2 learning objectives (Figure 12), (1) students can identify family members in Arabic, and (2) students can read the meaning of family members in Arabic. The learning objectives, to support students in understanding Arabic material. especially can improve student learning outcomes, when receiving learning outcomes from schools.

Figure 13

Conversational text material



The "assyakanu" text material, which has been packaged in learning media, adapts KIKD in the Arabic language guidebook. "Assyakanu" material, the selected material adjusts the students' ability to understand and practice it in class and at home. One of the goals of students is to be trained with *muhadasah* to practice and practice the memorized mufrodat, each *mufrodat* has 5 vocabularies. *Muhadasah* training activities are usually carried out after learning or after students study neuroscience media. Students are trained by the teacher to practice with their classmates (Figure 13).

3.7. Activity Benefits

The implementation benefits of developing neuroscience-based Arabic learning media at SMK Muhammadiyah 3 Yogyakarta. Make it easier for students to understand and analyze Arabic learning material from the teacher. With the Arabic language learning media based on neuroscience, students can develop and improve learning outcomes and students. Especially on the effectiveness of student learning outcomes with the final result, 20 students were able to develop *qiro'ah*, *kitabah*, *kalam*, and *muhadasah* skills. Media-Neuroscience in learning Arabic as a novelty or prototype model of product development that can facilitate students. It is known that so far, at SMK Muhammadiyah 3 Yogyakarta, students' results from learning Arabic have decreased every year. The percentage rate decreased from 100% to 60%.

4. Discussion

4.1. Arabic Learning Media in the Covid-19 Period

The presence of COVID-19 causes learning problems, including students at home losing access to online learning (Nagy et al., 2021). One of the obstacles that often occurs is that students lose interaction with teachers, and students who live in their homes in remote areas, experience signal difficulties or internet access (Zhang et al., 2021).

Explicitly learning Arabic, as reported by the information from DIKDASMEN PWM DIY, one of the institutions that oversee the learning of Arabic for all students of Muhammadiyah Vocational High School in Yogyakarta has decreased significantly (Jailani et al. 2021g). Face-to-face learning requires strong ways and strategies, including brain and reason-based learning concepts and strategies (Suyadi et al., 2019).

Arabic learning media in the current era of information technology must innovate a lot and find new ways to increase learning effectiveness. This will be greatly influenced by the development of information technology including computers, DVD (Digital, Video, Disc), video conferencing, and so on. Computers have strategic value and affect all tools and media in learning, both audio and media

(Gunarti, 2020; Mohsen & Mahdi 2021). Thus, audio-visual is a design medium, so that in using it requires a special design and is designed in such a way that it can be used properly and correctly (Amatullah and Kusumaningrum, 2020). The hardware that is used to inspire the media is a complete computer unit that is already connected to the LCD projector so that the media can be used in learning Arabic (Fadila and Yanuarti, 2019). Audio-visual media are media that have sound and image elements. This media is divided into silent audio-visuals such as sound slide films and sound series films, and motion audio-visuals, such as sound films and cassette films (Fadila & Yanuarti, 2019).

Audio-visual media is a set of tools that can sound the same character as the original object. Continued by Febrian Eko Priandono et al, the learning media used by teachers vary, including the media commonly used by teachers in the classroom, namely visual media in the form of slide shows (Priandono et al., 2012). Audio-visual media are widely used by teachers because they are quite simple and easy to make. Eka gave an example in his research, one way that can facilitate understanding of the concept of physics is to use media in the form of audio-visual (Priandono et al., 2012).

According to Sanjaya, audio-visual media is a type of media that in addition to containing elements of sound also contains elements of images that can be seen, such as video recordings, and various recordings. the *film*, sound slides, and so on. The ability of this media is considered better and more interesting because it contains the first and second elements, through group guidance using audio-visual is expected to help increase the learning motivation of low students, this is because using audio-visual media in group guidance can facilitate delivery messages and understanding to students (Pranowo and Prihastanti, 2020; Calafato, 2023).

Associated with the increasingly religious learning media. Arqam said media selection should pay attention to several principles. That is; (a) Clarity of the intent and purpose of media selection, whether for entertainment, general information, learning, and so on, and (b) Media familiarity which involves knowledge of the nature and characteristics of the media to be selected, and (3) Several media can be compared because of their several options that would be more in line with the learning objectives (Arqam, 2010).

Many studies have been conducted regarding which instructional media are most relevant for a particular purpose, and the research results show that; 1) Not every learning media can be used to achieve any learning objectives, 2) All learning media can assist teachers in carrying out one or several functions in learning, such as telling stories, controlling/checking, providing reinforcement and conducting evaluations. There is even a possibility that the media will take over the function, for example, a film that tells the growth process (Hendra & Laura, 2019).

Furthermore, it stated that the selection of audio-visual media in addition to looking at its suitability for specific instructional objectives, subject matter, didactic procedures, and the form of student grouping, must also consider the cost factor, availability of equipment, the time needed (availability factor), availability of electricity, quality technical quality, classrooms, and the ability of teachers to use the media appropriately (technical know-how) (Nashoih & Darmawan, 2019).

The selection of media should not be separated from the context that which media is a component of the overall instructional system. Therefore, even though the objectives and contents are known, other factors such as student characteristics, teaching-learning strategies, study group organization, allocation of time and resources, and assessment procedures also need to be considered (Mufidah & Rohima, 2020).

In addition to conformity with learning behavior, there are at least four other factors that need to be considered in the selection of audio-visual media, namely: first, the availability of local sources. This means that if the media in question is not available from existing sources, it must be purchased or made by yourself. The second is a factor that concerns the flexibility, practicality, and

durability of the media for a long time. This means that it can be used anywhere with equipment around it and at any time and is easy to carry and move (Mahnun, 2012).

Yusufhadi Miarso stated that the first thing a teacher should do in using audio-visual media effectively is to search for, find, and select media that meets the learning needs of children, attracts children's interest, according to the development of maturity and experience as well as the special characteristics of the study group. These characteristics include the maturity of the child and his background experience as well as mental conditions related to his developmental age (Azkia Muharom Albantani, 2019).

Edgar Dale has shared layered experiences from the highest level of concrete to the most abstract. This classification is known as Edgar Dale's "cone of experience" which helps determine what media is most appropriate for a particular learning experience (Huda, 2016).

Rudy Bretz divides the media according to the main characteristics of the media into three elements, namely sound, visual, and motion. Furthermore, the division was developed into seven groups, namely: a). Motion audio-visual media; is the most complete media because it uses audio-visual and motion skills, b). Audio-visual media-silent; have visual abilities and movement without sound, e). Visual-silent media: can convey information visually but does not display sound or motion, f). audio media; media that only manipulates the ability to make sounds, g). Print media; is media that is only able to display information in the form of letters and certain verbal symbols (Mahnun, 2012).

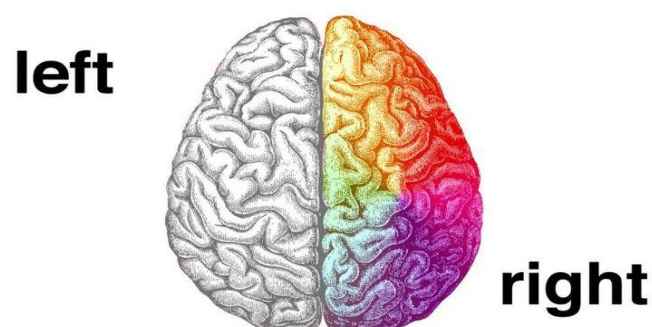
4.2. Neuroscience-Based Arabic Learning Media in the Covid-19 Period

Neuroscience-based media is a scientific correlation that explains the relationship between the brain and the mind (brain-mind-connection) (Awhinarto, 2020), or soul and body (Ferretti et al., 2020). Neuroscience scientific studies specialize in the function of nerves in the brain which then develop and expand in the anatomy of the human body Fundamentally, neuroscience pays attention to the neuro-anatomy of the brain (brain structure) and brain neurophysiology (brain parts and functions) whose function is to make an important contribution to the transfer of knowledge morally and rationally (Hilmi, 2020).

This media is conceptualized with audio-visual media that adapts to the indicators and basic competencies in the Arabic language material chapter. Neuroscience-based Arabic learning media maximizes the intelligence function of the front part of the brain called the prefrontal cortex as the focus and concentration of students on the material (Wahdan et al., 2020; Khalil et al., 2021).

Recent research in the field of neuroscience has found some evidence of an inseparable relationship between the brain and human behavior (character) (Suyadi, 2020a). Through the Positron Emission Tomography (PET) instrument, it is known that six brain systems integrated regulate all human behavior (Jailani & Suyadi, 2021c). The six brain systems are the prefrontal cortex, limbic system, cingulate gyrus, basal ganglia, temporal lobes, and cerebrum (Juliani et al., 2020). Just an example of a researcher from a neuroscience study to be specific and directed students are directed and trained in the approach of the right brain, left brain, and midbrain (Suyadi, 2020a). To make it easier to understand the right brain and left brain researchers describe them in figure 14 below:

Figure 14
Right and left brain



Suyadi (2020e), an expert in neuroscience and Islamic education, stated in his book *Islamic Education and neuroscientists, Tracing the Traces of Intellect and Brain in the Qur'an to the Development of Neuroscience in Islamic Education* (Astuti Budi Handayani, 2019), then it is the left brain that is more active (but this does not mean that the right brain is passive) (Suyadi, 2020a). The following is an example of mufrodat material delivered through neuroscience-based Arabic learning media:

Figure 15

Arabic mufrodat text material

Figure a.



The material for picture 15 above is a material that is conveyed through animation on learning media to students (Apri & Suyadi, 2019), Chapter on family (*al-ailah*) (Fadilah & Suyadi, 2020). Students are taught about *maharah qiro'ah* good reading, *maharah istima'* good listening, *maharah kitabah* writing correctly and *imla'*, and finally students are expected to be able to practice by speaking *maharah kalam* (Kharisma Noor Latifatul Mahmudah, 2020).

There are several relevant studies, with this research in the form of scientific works that are used as a reference in the preparation of learning media by the author. Research in the form of a thesis conducted by Melani Akbar in 2014 from the State Islamic University of Maulana Malik Ibrahim Malang entitled *Development of Arabic Teaching Materials Based on Interactive Multimedia Class V MIN Druju Sumbermanjing Wetan Malang Regency*. This research produces a product in the form of an interactive module in Arabic subjects based on Macromedia Flash. There are four themes presented in this module in one semester. The result of this research is that the product in the form of this interactive module gets very good qualifications with the percentage of validity reaching 100%.

Second, research in the *Journal of Arabic Learning Teaching* belonging to the State University of Semarang was conducted by Sulastri in 2016 on the *Development of Arabic Thematic Video Learning Media on Speaking Skills for Class VIII MTs Students*. The product produced in this study is a video on

a thematic learning DVD containing competency menus, vocabulary, video conversations, discussions, evaluations, and profiles presented using the Adobe Flash CS6 application. Based on the assessment of media and material experts, this product has been assessed as feasible in terms of material and appearance (Sulastri, 2016).

Third, research in the *Lisania Journal*; *Journal of Arabic Education and Literature* belonging to IAIN Salatiga in 2017 conducted by Wakhidati Nurrohmah Putri with the title *The Effect of Learning Media on Motivation to Learn Arabic for Tssanawiyah Madrasah Students*. The method used in this research is descriptive quantitative with data processing using descriptive statistics and product-moment correlation tests. Based on the hypothesis test, the correlation coefficient (r) is 0.4723, which is greater than 0.207 with a significant level of 5%. The results of this study show that there is a significant influence between learning media on students' learning motivation, especially in learning Arabic (Putri, 2017).

Fourth, research in the form of a thesis conducted by Suluri in 2019 from Ahmad Dahlan University on the *Development of Android-based Arabic Learning Media to Improve Mufrodat and Qawaid Learning Achievements*. The innovation made is the creation of an Android-based ArabMu application that contains material and quizzes related to vocabulary and grammar on the themes of everyday life. This innovation has proven to be effective in improving student achievement in terms of vocabulary and grammar.

Fifth, research in the form of a scientific journal conducted by Mufidah (2019) published in the *Al-Mudarris Journal* belonging to STAI Ma'had Aly Al-Hikam Malang with the title *Hybrid Learning in Arabic Vocabulary Learning for Children Assisted by Al-Mutho Media*. The method used in this research is a descriptive qualitative case study. The results of this study indicate that they are more enthusiastic about learning mufrodat using Al-Mutho media (Mufidah, 2019). Song-based Arabic textbook teaching materials can improve students' competence in cognitive and psychomotor aspects (Bustam et al., 2021).

5. Conclusion

Based on the results and discussion above, it can be concluded that the material brain-based learning media is considered very feasible to be applied in Arabic teaching and learning activities. In addition, this learning media is considered effective to be implemented in the process of learning Arabic. Both mufrodat and *muhadasah* materials with product effectiveness were obtained from two validations. That consists of the validation of media experts and material experts. Each of these validators consists of 2 material expert validations and 2 media expert validators. Through material expert validator 1 with an average value of 5.0 with "good" criteria. The material expert validator 2 gave a value of 5.0 with the criteria of "good".

For the assessment of media experts, media expert 1 gave an average score of 4.83 with the criteria of "good". Media Expert 2 gave a score of 3.66 in the "good" category. The input for revisions from media experts and material experts is related to the duration of time and the title of the material. The input from the two validation experts is intended for the manufacture of media products in the next edition. Product development is not a very specific error (noise). This means that it is still included in the scope and principles of learning media within the scope of audio-visual. The increase in student learning outcomes is evidenced by learning outcomes which state the increase in students' ability to memorize mufrodat. This proves that the learning media developed is effective in providing an alternative to students' difficulties in understanding the material. This research differs from previous research in the audio-visual aspect, the material is *mufrodat* and *muhadasah*, which is fun.

The research has limitations, researchers have not discussed the aspects of learning motivation, increasing talent, and interest in Arabic. and linking this research to the development aspect of the Arabic curriculum specifically. Therefore, researchers recommend academics, teachers,

and lecturers follow up on this research. For example, research on song-based learning media, game-based learning media, and the development of other Arabic teaching materials. Finally, the researcher inputs into research on the development of the Arabic language curriculum both in formal schools and in non-formal institutions.

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References

- Abu Bakar Shiddiq. (2020). the Application of « Nemo » Artificial Intelligence in Arabic Language Learning in the 4.0 Revolution Era at Al- Khalifah Islamic Boarding School Cibubur. *Ijlecr - International Journal of Language Education and Culture Review*, 6(1), 58–61. <https://doi.org/10.21009/ijlecr.061.07>
- Abu-Remaih, R. (2021). Country of words: Palestinian literature in the digital age of the refugee. *Journal of Arabic Literature*, 52(1–2), 68–96. <https://doi.org/10.1163/1570064x-12341420>
- Akmaliyah, Hudzaifah, Y., Ulfah, N., & Pamungkas, M. I. (2021). Child-friendly teaching approach for Arabic language in an Indonesian Islamic boarding school. *International Journal of Language Education*, 5(1), 501–514. <https://doi.org/10.26858/IJOLE.V5I1.15297>
- Akzam, I., Supriady, H., & Alfitri. (2021). Improve Arabic Language and Islamic Skills with BISA System to Arab Village. *Linguistics and Culture Review*, 5(August), 624–632.
- Al Zumor, A. Q. (2019). Challenges of using EMI in teaching and learning of university scientific disciplines: Student voice. *International Journal of Language Education*, 3(1), 74–90. <https://doi.org/10.26858/ijole.v1i1.7510>
- Albantani, A. M., & Madkur, A. (2017). Musyahadat Al Fidyu: Youtube-Based Teaching and Learning of Arabic as Foreign Language (AFL). *Dinamika Ilmu*, 17(2), 291–308. <https://doi.org/10.21093/di.v17i2.854>
- Alhirtani, N. A. K. (2019). The Use of Modern Teaching Methods in Teaching Arabic Language at Higher Education Phase from the Point View of Arabic Language Professors—A Case of a Premier University. *International Education Studies*, 13(1), 32. <https://doi.org/10.5539/ies.v13n1p32>
- Al-Khresh, M. H., Khaerurrozzikin, A., & Zaid, A. H. (2020). The efficiency of using pictures in teaching speaking skills of non-native Arabic beginner students. *Universal Journal of Educational Research*, 8(3), 872–878. <https://doi.org/10.13189/ujer.2020.080318>
- Alqahtani, G., & Alothaim, A. (2022). Emotion Analysis of Arabic Tweets: Language Models and Available Resources. *Frontiers in Artificial Intelligence*, 5, 843038. <https://www.frontiersin.org/articles/10.3389/frai.2022.843038/full>
- Alsubaie, M. A. (2022). Impacts of Technology in Learning: Mobile Typing Applications for Writing and Accomplishing Academic Tasks among Arabic-Speaking Undergraduate Students. *Education Sciences*, 12(12), 891. <https://www.mdpi.com/2227-7102/12/12/891>
- Amatullah, M. N., & Kusumaningrum, N. (2020). Pendekatan Keterampilan Dalam Pembelajaran Bahasa Arab. *An Nabighoh: Jurnal Pendidikan Dan Pembelajaran Bahasa Arab*, 22(02), 231. <https://doi.org/10.32332/an-nabighoh.v22i02.1945>
- Apri, W., & Suyadi. (2019). Pengembangan Emosi Positif Dalam Pendidikan Islam Perspektif Neurosains. *Tadrib*, 5(1), 51–67.
- Arqam, M. L. (2010). *Pengembangan Multimedia Pembelajaran pada Mata Pelajaran Kemuhammadiyah bagi Siswa Kelas I Madrasah Mu'allimin Muhammadiyah Yogyakarta*. Universitas Sebelas Maret Surakarta.
- Astuti Budi Handayani, S. (2019). Relevansi Konsep Akal Bertingkat Ibnu Sina Dalam Pendidikan Islam di Era Milenial. *TADIBUNA*, 8(2), 222–240. <https://doi.org/10.32832/tadibuna.v8i2.2034>

- Awhinarto, S. (2020). Otak Karakter Dalam Pendidikan Islam: Analisis Kritis Pendidikan Karakter Islam Berbasis Neurosains. *Jurnal Pendidikan Karakter*, 10(1), 143–156. Retrieved from <http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf>
- Azkiya Muharom Albantani. (2019). Social Media as Alternative Media for Arabic Teaching in Digital Era. *Alsinatuna Journal of Arabic Linguistics and Education*, 4(2), 5–24.
- Belkacem, A. N., & Lakas, A. (2021). A Case Study on Teaching aBrain–Computer Interface Interdisciplinary Course to Undergraduates BT - Smart Education and e-Learning 2021. In V. L. Uskov, R. J. Howlett, & L. C. Jain (Eds.), *Learning Media Arabic* (pp. 215–228). Singapore: Springer Singapore.
- Bustam, B. M. R., Iswanto, I., Arqam, M. L., Juliani, W. I., & Khairi, A. N. (2021). The effectiveness of fun learning approach in arabic learning. *Jurnal Al Bayan: Jurnal Jurusan Pendidikan Bahasa Arab*, 13(2), 286-304. <http://ejournal.radenintan.ac.id/index.php/albayan/article/view/8681>
- Calafato, R. (2023). Charting the motivation, self-efficacy beliefs, language learning strategies, and achievement of multilingual university students learning Arabic as a foreign language. *Asian-Pacific Journal of Second and Foreign Language Education*, 8(1), 20. <https://link.springer.com/article/10.1186/s40862-023-00194-5>
- Chair, J.-I. Ki., Annie, C., & Wright, B. (2020). Chinese Adult English Learners' (AELs) Learning Obstacles: Examination from Neurolinguistic Psychosocial, and Sociolinguistic Perspectives. *Orphanet Journal of Rare Diseases*, 21(1), 1–9.
- Creswell, J. W. (2018). *Penelitian Kualitatif dan Desain Riset* (pertama; Syaifuddin Zuhri Qudsi, Ed.). Yogyakarta: Pustaka Pelajar.
- Das, A. R. (2021). Paul kraus, Richard Walzer, and Galen's com. Tim. *Arabic Sciences and Philosophy*, 31(2), 225–256. <https://doi.org/10.1017/S0957423921000072>
- Desfa, Y., Suyadi, Hendro, W., & Asyraf, S. (2020). Creative Imagination Base on Neuroscience: A Development and Validation of Teacher's Module in Covid-19 Affected Schools. *Universal Journal of Educational Research*, 8(1), 5849–5858. <https://doi.org/10.13189/ujer.2020.082218>
- Duek, S., & Nilsberth, M. (2022). Languages and identity constructions in multilingual students' digital literacy practices. *Education Inquiry*, 13(1), 1-17. <https://www.tandfonline.com/doi/abs/10.1080/20004508.2022.2109561>
- Duman, B. (2006). The effect of brain-based instruction to improve on students' academic achievement in social studies instruction. In *9th International Conference on Engineering Education, San Juan, Puerto Rico*. <https://www.ineer.org/Events/ICEE2006/papers/3380.pdf>
- Esmaeili, M. J. (2021). The sciences of the ancients and their divisions aqsam? ulum al-awa? il; A text attributed to Avicenna, an edition with a brief introduction. *Arabic Sciences and Philosophy*, 31(2), 183–223. <https://doi.org/10.1017/S0957423921000060>
- Fadila, F., & Yanuarti, E. (2019). Pelayanan Sosial dan Keagamaan Dengan Menggunakan Media Audio Visual Dalam Meningkatkan WPKNS ABH di Lembaga Permasalahatan Kelas II A Curup. *Islamic Counseling: Jurnal Bimbingan Konseling Islam*, 3(1), 17. <https://doi.org/10.29240/jbk.v3i1.798>
- Fadilah, H., & Suyadi. (2020). Mirror Neuron in The Perspective of Islamic Education. *Edukasi*, 8(2), 26.
- Fauzi M.I. (2020). Pemanfaatan Neurosains dalam Desain Pengembangan Kurikulum Bahasa Arab. *Arabiyatuna: Jurnal Bahasa Arab*, 4(1), 1. <https://doi.org/10.29240/jba.v4i1.1095>
- Febriana, S. Z. N. N. A. (2020). The Fiqh of Disaster: The Mitigation of Covid-19 in the perspective of Islamic education-neuroscience. *International Journal of Disaster Risk Reduction, IJDRR_2020*, Article Inpress.
- Ferretti, T. R., Katz, A. N., Schwint, C. A., Patterson, C., & Pradzynski, D. (2020). How discourse constraints influence neurolinguistic mechanisms during the comprehension of proverbs. *Cognitive, Affective and Behavioral Neuroscience*, 20(3), 604–623. <https://doi.org/10.3758/s13415-020-00790-9>
- Gall, B. (1989). *Educational research: An introduction* ((5th Ed.) Boston-USA: Allyn and Abcon.
- Gunarti, T. T. (2020). Pengembangan Media Pembelajaran Bahasa Arab Berbasis Audio Visual untuk meningkatkan Maharah Istima' pada siswa-siswi Madrasah Ibtidaiyah. *Awwaliyah Jurnal PGMI*, 3(2), 122–129.
- Habib, M. A. (2017). Catat Inilah!! Perbedaan Antara Otak Kanan dan Otak Kiri. Retrieved from Intisari Online website: <https://intisari.grid.id/read/0397022/catat-inilah-perbedaan-sebenarnya-antara-otak-kanan-dan-otak-kiri?page=all>
- Hendra, F., & Laura, H. M. (2019). Multaqa Nasional Bahasa Arab (MUNASBA) KE-II. *Pengaruh Spiritual Quotient Dan Emotional Quotient Dalam Proses Belajar Bahasa Arab*, 27–38. Jakarta: Universitas Al Azhar Indonesia (UAI) Jakarta.

- Hilmi, D. (2020). Impact Of Arabic Online Learning in The Perspective of How the Brain Learns. *Ijaz Arabi Journal of Arabic Learning*, 4(1), 59–73. <https://doi.org/10.18860/ijazarabi.v4i1.10442>
- Huda, M. (2016). Pembelajaran Berbasis Multimedia dan Pembelajaran Konvensional. *Jurnal Penelitian*, 10(1), 125–146.
- Huneety, A., Mashaqba, B., Al-Quran, M., & Hishma, J. (2020). Stress production by Cebuano learners of Arabic: A metrical analysis. *Indonesian Journal of Applied Linguistics*, 9(3), 517–525. <https://doi.org/10.17509/ijal.v9i3.23201>
- Iljina, O., Derix, J., Schirmeister, R. T., Schulze-Bonhage, A., Auer, P., Aertsen, A., & Ball, T. (2017). Neurolinguistic and machine-learning perspectives on direct speech BCIs for restoration of naturalistic communication. *Brain-Computer Interfaces*, 4(3), 186–199. <https://doi.org/10.1080/2326263X.2017.1330611>
- Jailani, M. (2021a). Developing Arabic Media Based on Brain-Based Learning: Improving Mufrodlat in School. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 6(2), 349–361. <https://doi.org/10.24042/tadris.v6i2.9921>
- Jailani, M. (2021b). Kajian Pendekatan Hermeneutika dalam Tafsir Al-Qur'an Perspektif Ulama Muslim Kontemporer. *Journal of Qur'an and Hadits Studies*, 10(1), 93–121.
- Jailani, M. (2021c). The Concept Of ' Aql and Brain in The Quran and Neuroscience: A Concept Analysis of Nāṣiyah In Salman's Tafsir. *Ilmu Ushuuluddin*, 8(2), 255–276.
- Jailani, M. (2022). The Use of Neuroscience in the Design of Development of Arabic Learning Materials for Santri: A Case Study in Pesantren during the COVID-19 Period. 449–455.
- Jailani, M., & Perawironegoro, D. (2021). Neuroscience Media in Arabic Teaching: Fun and Easy for Students Media Neuroscience Dalam Pengajaran Bahasa Arab: Menyenangkan dan Mudah Bagi Siswa. *Al Mahāra Jurnal Pendidikan Bahasa Arab*, 7(2), 231–253. <https://doi.org/10.1088/1742-6596/1779/1/012008.1>
- Jailani, M., & Suyadi, S. (2021c). MEMBANGUN BISNIS EKONOMI ISLAM PERSPEKTIF NEUROMARKETING DI MASA PANDEMIC COVID-19. *Islamic Economics, Finance, and Banking Review*, 1(2), 1–19.
- Jailani, M., & Suyadi, S. (2021c). Pendidikan Agama Islam Berbasis Neurosains dan Perspektif Akal Bertingkat Ibnu Sina di Sekolah: Implikasinya terhadap Pembelajaran Pendidikan Agama Islam di Era Pandemi Covid-19. *Jurnal Litbang Edusaintech*, 2(2), 123-134. <http://cvt2olympicad6.unimus.ac.id/index.php/jle/article/download/55/57>
- Jailani, M., & Suyadi. (2021a). Muhammadiyah Covid-19 Islamic Boarding School: A Complete Self-Isolation Model with Neurospiritual and Psychosocial Approaches. *Islam Realitas: Journal of Islamic and Social Studies*, 7(2), 25–33.
- Jailani, M., & Suyadi. (2021b). The Relevance of K.H. Ahmad Dahlan's Tajdid Thoughts on Islamic Education During the Covid-19. *Jurnal Educative: Journal of Educational Studies*, 6(2), 111–128.
- Jailani, M., & Widodo, H. (2021). Implementation of the Use of Neuroscience-Based Arabic Learning Media on Students: A Case Study at Vocational High School Muhammadiyah 3 Yogyakarta. *Arabiyatuna Jurnal Bahasa Arab*, 5(2), 267–288.
- Jailani, M., Bustam, B. M. R., & Suyadi. (2021f). Prosiding Seminar Nasional 3rd TELCECON Menjadi Pendidik Kreator: "Kreatif, Tangguh, Optimis dan Realistis. In M. P. Dr. Achmad Hilal Madjid, M. P. Drs. Suprihadi, & M. H. Dr. Ahdi Riyono (Eds.), *Isma Fa'il Dalam Kitab Al-Amsilah At-tasrifiyah Implikasinya terhadap Al-Qur'an Surat Al-Baqarah dengan Pendekatan Morfosemantik* (pp. 1–111). Kudus, Jawa Tengah, Indonesia: Badan Penerbit Universitas Muria Kudus. Retrieved from https://pbi-fkip.umk.ac.id/index.php?option=com_sppagebuilder&view=page&id=80
- Jailani, M., Husna, J., & Kholis, N. (2022b). Membedah Hermeneutika Perspektif Ilmuan Muslim Modern: Korelasinya dalam Studi Ilmu Hadits. *AL QUDS: Jurnal Studi Alquran Dan Hadis*, 6(1), 211. <https://doi.org/10.29240/alquds.v6i1.3028>
- Jailani, M., Perawironegoro, D., & Widodo, H. (2021). INNOVATING STUDENT ADMISSION USING NEUROSCIENCE PERSPECTIVE: LEARNING FROM MUHAMMADIYAH VOCATIONAL SCHOOLS. *MANAGERIA: Jurnal Manajemen Pendidikan Islam*, 6(2), 223-238. <https://ejournal.uin-suka.ac.id/tarbiyah/manageria/article/view/4236>
- Jailani, M., Suyadi, & Bustam, B. M. R. (2021b). The First HISPISI International Conference on Humanities, Education, Law, and Social Sciences "New Findings during Pandemic in Social Science, Humanities, Education and Law." In P. J. A. Banks, P. I. Davies, P. Y. H. Chen, P. Z. Baidhawiy, A. P. B. Tarman, & Associate Professor Dr. Zulhamri Abdullah (Eds.), *Neuroscience Based Islamic Learning a Critique of the Holistic Education Crisis in Pamekasan Madura* (pp. 123–134). Jakarta: Universitas Negeri Jakarta.
- Jailani, M., Suyadi, & Bustam, B. M. R. (2021g). EDISI KHAS: Pengajian Islam dan Cabaran Pandemi COVID-19. In R. Zakaria, S. Ismail, M. M. Daud, & S. M. Z. B. Koyak (Eds.), *PERKEMBANGAN MEDIA PEMBELAJARAN*

- BAHASA ARAB BERBASIS NEUROSAINS: KAJIAN LAPANGAN DI SEKOLAH MENENGAH KEJURUAN DI MASA COVID-19* (pp. 44–50). Malaysia: Kolej Universitas Islam Antarbangngsa Selangor (KUIS).
- Jailani, M., Suyadi, S., & Widodo, H. (2021e). the Utilization of a Neurolinguistic Approach to Students for Arabic Language Learning Development. *Arabiyat: Jurnal Pendidikan Bahasa Arab Dan Kebahasaaraban*, 8(2), 209–227. <https://doi.org/10.15408/a.v8i2.21503>
- Jailani, M., Suyadi, S., Latifa, R., & Azkiyah, S. (2022). Critical Analysis of Aql and Brain in the Qur'an and Neuroscience and Its Implications for the Development of Islamic Education. <https://doi.org/10.4108/eai.20-10-2021.2316341>
- Jailani, M., Suyadi, S., Sesmiarni, Z., & Albar, M. K. (2021c). THE DEVELOPMENT OF A NEW STUDENT ADMISSION PROMOTION MODEL IN THE STUDY OF NEUROSCIENCE IN THE ERA OF THE COVID-19 PANDEMIC: A Case Study at SMK Muhammadiyah 3 Yogyakarta, Indonesia. *Idaarrah: Jurnal Manajemen Pendidikan*, 5(2), 204-222. <https://journal3.uin-alauddin.ac.id/index.php/idaarah/article/view/21173>
- Jailani, M., Suyadi, Wanojaleni, K., & Tsauri, S. (2021f). Proceeding IConIGC: International Conference on Islamic and Global Civilization. *PENERIMAAN PESERTA DIDIK BARU DI MASA COVID-19 PERSPEKTIF NEUROSAINS: STUDI KASUS DI SMK MUHAMMADIYAH 3 YOGYAKARTA*, 49–65. Malang: Faculty of Islamic Studies University of Islam Malang.
- Jailani, M., Wantini, Suyadi, & Bustam, B. M. R. (2021d). Meneguhkan Pendekatan Neurolinguistik dalam Pembelajaran: Studi Kasus pada Pembelajaran Bahasa Arab Madrasah Aliyah. *Al-Thariqah Jurnal Pendidikan Islam*, 6(1), 152–167.
- Jamal G. and Hala S. (2021). Rendering Translation Studies Terminology from English into Arabic: Identification of Methodology and Assessment of Adequacy. *International Journal of Arabic-English Studies*, 21(2), 125–146. <https://doi.org/10.33806/ijaes2000.21.2.7>
- Juliani, W. I., Sabili, A. R., & Suyadi. (2020). Tafsir Ayat-Ayat Neurosains dan Implikasinya bagi Pengembangan Higher Order Thingking (HOT) dalam Pendidikan Islam. *Muaddib*, 10(01), 84–96.
- Kelas, W. Kuisiонер Penelitian Studi Pendahuluan Pembelajaran Bahasa Arab. (2021).
- Khalil, E. A. H., Houbby, E. M. E., & Mohamed, H. K. (2021). Deep learning for emotion analysis in Arabic tweets. *Journal of Big Data*, 8, 1-15. <https://link.springer.com/article/10.1186/s40537-021-00523-w>
- Kharisma Noor Latifatul Mahmudah, S. (2020). Akal Bertingkat Ibnu Sina dan Taksonomi Bloom dalam Pendidikan Islam Perspektif Neurosains. *Edukasi Islamika: Jurnal Pendidikan Islam*, 5(1), 121–138.
- Kohl, K., Willard, J. A., Agache, A., Bihler, L. M., & Leyendecker, B. (2019). Classroom quality, classroom composition, and age at entry: Experiences in early childhood education and care and single and dual language learners' German vocabulary. *AERA Open*, 5(1), 2332858419832513. <https://journals.sagepub.com/doi/abs/10.1177/2332858419832513>
- Kurniawan, R., Asmara, M., & Hardivizon, H. (2021). Arabic Language and the Concept of l'jaz al-Qur'an (Critics to Louwis 'Awad's thoughts/Bahasa Arab dan Konsep l'jaz al-Qur'an (Kritik Pemikiran Louwis 'Awad). *Arabiyatuna: Jurnal Bahasa Arab*, 5(1), 161. <https://doi.org/10.29240/jba.v5i1.2622>
- Mahnun, N. (2012). MEDIA PEMBELAJARAN (Kajian terhadap Langkah-langkah Pemilihan Media dan Implementasinya dalam Pembelajaran). *Jurnal Pemikiran Islam*, 37(1), 1–15.
- Malkawi, A. (2020). The Understanding of Graduate Students at Yarmouk University of the Principles of Brain-Based Learning and their Attitudes towards them. *International Journal of Psychosocial Rehabilitation*, 24(03), 1033–1043. <https://doi.org/10.37200/ijpr/v24i3/pr200855>
- Masrai, A. (2020). Can L2 Phonological Vocabulary Knowledge and Listening Comprehension be Developed Through Extensive Movie Viewing? the Case of Arab EFL Learners. *International Journal of Listening*, 34(1), 54–69. <https://doi.org/10.1080/10904018.2019.1582346>
- Mauli, B., Bustam, R., Widodo, H., & Perawironegoro, D. (2021). The Use of Neuroscience in the Design of Arabic Learning Material Development: Its Implications for Arabic Language Education. *Islam in Word Perspectives*, 1(2), 65–80.
- Mohammadipur, M. (2018). *Relationships Between Language Learning Strategies, Positive Emotions, Language Learning Motivation, and English Language Proficiency Among Malaysian ESL Undergraduates*. University Putra Malaysia.
- Mohsen, M. A., & Mahdi, H. S. (2021). Partial versus full captioning mode to improve L2 vocabulary acquisition in a mobile-assisted language learning setting: words pronunciation domain. *Journal of Computing in Higher Education*, 33(2), 524-543. <https://link.springer.com/article/10.1007/s12528-021-09276-0>
- Mufidah, N. (2019). Pengajaran bahasa Arab menyenangkan dengan media lagu untuk Madrasah Ibtidaiyah. *Al-Mudarris: Journal of Education*, 2(2), 166-185. <http://repository.uin-malang.ac.id/11812/>

- Mufidah, N., & Rohima, I. I. (2020). Pengajaran Kosakata untuk Mahasiswa Kelas Intensif Bahasa Arab (Vocabulary Teaching for Arabic Intensive Class). (*Ujss*) *Uniqbu Journal of Social Sciences*, 5(1), 55.
- Munir, M., & Nur, R. H. (2018). The development of an English learning model based on contextual teaching and learning (Ctl) in junior high schools. *International Journal of Language Education*, 2(1), 31–39. <https://doi.org/10.26858/ijole.v2i1.4326>
- Nagy, E., Infantino, M., Bizzaro, N., Andreeva, H., Bontkes, H. J., Bossuyt, X., ... Damoiseaux, J. (2021). The impact of the COVID-19 pandemic on autoimmune diagnostics in Europe: A lesson to be learned. *Autoimmunity Reviews*, 20(August). <https://doi.org/10.1016/j.autrev.2021.102985>
- Nashoih, A. K., & Darmawan, M. F. (2019). Pengembangan Bahan Ajar Nahwu Berbasis Kontrastif Untuk Mengatasi Interferensi Bahasa Indonesia Terhadap Bahasa Arab. *Arabiyatuna: Jurnal Bahasa Arab*, 3(2), 335. <https://doi.org/10.29240/jba.v3i2.1008>
- Pranowo, T. A., & Prihastanti, A. (2020). Pengaruh Bimbingan Kelompok Melalui Media Audio Visual Terhadap Motivasi Belajar Siswa. *Indonesian Journal of Learning Education and Counseling*, 2(2), 217–223. <https://doi.org/10.31960/ijolec.v2i2.338>
- Priandono, F. E., Astutik, S., & Wahyuni, S. (2012). Pengembangan Media Audio-Visual Berbasis Kontekstual. *Jurnal Pembelajaran Fisika*, 1(3), 247–254.
- Putri, W. N. (2017). Pengaruh Media Pembelajaran Terhadap Motivasi Belajar Bahasa Arab Siswa Madrasah Tsanawiyah. *LISANIA: Journal of Arabic Education and Literature*, 1(1), 1-16. <https://lisania.iainsalatiga.ac.id/index.php/lisania/article/view/1160>
- Reality, T. H. E., Arabic, O. F., Learning, L., On, I., Language, A., & In, E. (2021). THE REALITY OF ARABIC LANGUAGE LEARNING AT THE SMA / SMK AND PONDOK PESANTREN LEVEL: IMPLICATIONS ON ARABIC LANGUAGE EDUCATION IN. 928–938.
- Ritonga, M., Kustati, M., Budiarti, M., Lahmi, A., Asmara, M., Kurniawan, R., ... Yenti, E. (2021). Arabic as foreign language learning in pandemic COVID-19 as perceived by students and teachers. *Linguistics and Culture Review*, 5(1), 75–92. Retrieved from <https://lingcure.org/index.php/journal/article/view/726>
- Saibah, & Suyadi. (2020). Constructivism Of Neurosains-Based in Building the Qur'ani Character of SMP Muhammadiyah 1 Sleman Students. *Edukasi*, 8(1), 85–95.
- Shearer, B. (2018). Multiple intelligences in teaching and education: Lessons learned from neuroscience. *Journal of Intelligence*, 6(3), 1–8. <https://doi.org/10.3390/jintelligence6030038>
- Shearer, B. C. (2020). The Theory of Multiple Intelligences After 40 Years: A Scientific Idea Whose Time Has Come or Gone? *An Interdisciplinary Journal Www. Psychologyandeducation. Net*, 57, 487-494. <https://www.stichtingami.nl/wp-content/uploads/2022/01/The-theorie-of-Multiple-Intelligences-after-40-Years.pdf>
- Sugiyono. (2017). *Metode Penelitian Kuantitatif Kualitatif dan R&D* (1st ed.). Bandung: Alfabeta.
- Sulastri, S. (2016). PENINGKATAN MOTIVASI DAN PRESTASI BELAJAR IPS MELALUI DISKUSI DAN EKSPOSITORI PADA SISWA KELAS V SDN 02 SEMBON KARANGREJO TULUNGAGUNG SEMESTER II TAHUN 2011/2012. *Jurnal Pendidikan PROFESIONAL*, 5(1). <http://www.jurnalpendidikanprofesional.com/index.php/JPP/article/view/130>
- Suntoro, R., & Suyadi. (2020). Konsep Akal Bertingkat Al-Farabi dalam Perspektif Neurosains dan Relevansinya dengan Pembelajaran Sains di Madrasah. *Risalah*, 6(2), 289–304.
- Suyadi, & Widodo, H. (2019). Millennialization of Islamic Education Based on Neuroscience in the Third Generation University in Yogyakarta Indonesia. *QIIS: Qudus International Journal of Islamic Studies*, 7(1), 173–202.
- Suyadi, M. P. I. (2020a). *Pendidikan Islam dan Neurosains: Menelusuri Jejak Akal dan Otak dalam Al-Qur'an Hingga Pengembangan Neurosains dalam Pendidikan Islam*. Prenada Media.
- Suyadi, M. P. I. (2020e). *Pendidikan Islam dan Neurosains: Menelusuri Jejak Akal dan Otak dalam Al-Qur'an Hingga Pengembangan Neurosains dalam Pendidikan Islam*. Prenada Media.
- Suyadi, Nuryana, Z., & Fauzi, N. A. F. (2020a). The fiqh of disaster: The mitigation of Covid-19 in the perspective of Islamic education-neuroscience. *International Journal of Disaster Risk Reduction*, 51(2), 1–15. <https://doi.org/doi.org/10/1016/J.ijdr.2020.101848>
- Suyadi, S., Asmorojati, A. W., Jailani, M., & Ismunandar, I. (2021). Pelatihan Dai Antikorupsi di Era Transisi Pilihan Lurah: Program Pembedayaan Masyarakat di Masa Pandemi COVID-19 Kalurahan Banguncipto, Kapanewon Sentolo Kulon Progo. In *Prosiding Seminar Nasional Hasil Pengabdian Kepada Masyarakat Universitas Ahmad Dahlan*, 3(1), 555-567. <http://seminar.uad.ac.id/index.php/senimas/article/view/7391>

Mohammad Jailani, Betty Mauli Rosa Bustam & Djamaluddin Perawironegoro (2023). The use of neuroscience in developing Arabic learning media: Its implications in vocational high schools. *World Journal on Educational Technology: Current Issues*, 15(4), 368-394. <https://doi.org/10.18844/wjet.v15i4.8643>

- Suyadi, S., Sumaryati, S., Hastuti, D., Yusmaliana, D., & MZ, R. D. R. (2019). Constitutional Piety: The Integration of Anti-Corruption Education into Islamic Religious Learning Based on Neuroscience. *J-PAI: Jurnal Pendidikan Agama Islam*, 6(1). <http://ejournal.uin-malang.ac.id/index.php/jpai/article/view/8307>
- Taufiqurrochman, R., Muslimin, I., Rofiki, I., & ABAH, J. A. (2020). Students' Perceptions on Learning Management Systems of Arabic Learning through Blended Learning Model. *Jurnal Al-Bayan: Jurnal Jurusan Pendidikan Bahasa Arab*, 12(1), 22–36. <https://doi.org/10.24042/albayan.v12i1.5276>
- Verawati, H., & Hasanah, U. (2021). The Modern Reform of Arabic Learning Paradigm and Its' Contribution toward the Development of Islamic Studies. *Al-Lisan: Jurnal Bahasa (e-Journal)*, 6(1), 71-84. <https://www.journal.iaingorontalo.ac.id/index.php/al/article/view/1866>
- Wahdan, A., Hantoobi, S., Salloum, S. A., & Shaalan, K. (2020). A systematic review of text classification research based on deep learning models in the Arabic language. *International Journal of Electrical and Computer Engineering*, 10(6), 6629–6643. <https://doi.org/10.11591/IJECE.V10I6.PP6629-6643>
- Wargadinata, W. W. (2020). Mediated Arabic Language Learning for Arabic Students of Higher Education in COVID-19 Situation. *Izdihar: Journal of Arabic Language Teaching, Linguistics, and Literature*, 3(1), 1–20. <https://doi.org/10.22219/jiz.v3i1.11862>
- Xuan, D., Ismail, W. M., & Zailani, M. A. (2020). Non-native Arabic learners' social media usage and motivation influencing learning of the Arabic language in Malaysian public universities. *International Journal of Language Education*, 4(2), 258–275. <https://doi.org/10.26858/ijole.v4i2.13980>
- Zainuddin, N., Saad, N. S. M., Harun, H., & Hashim, H. (2020). Development of Arabic Language Lifelong Learning (A3L) Tutorial Platform Using WhatsApp Mobile Application. *Creative Education*, 11(04), 452–467. <https://doi.org/10.4236/ce.2020.114033>
- Zhang, Z., Zhou, Y., Han, L., Guo, X., Wu, Z., Fang, J., ... & Yang, Z. (2022). Impacts of COVID-19 pandemic on the aquatic environment associated with disinfection byproducts and pharmaceuticals. *Science of The Total Environment*, 811, 151409. <https://www.sciencedirect.com/science/article/pii/S0048969721064871>