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DEVELOPMENT OF SONG-BASED AUDIOVISUAL CHEMISTRY MEDIA TO INCREASE INTEREST IN LEARNING THE MAIN GROUP ELEMENTS

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ABSTRACT

Providing a variety of media to support chemistry learning both at school and independently is essential. This research aims to develop chemistry audiovisual song-based media on Main Group Elements. This research uses the research and development (R&D) method with the 4-D model (define, design, develop, and disseminate). Audiovisual song-based media were validated by content and media experts, assessed by three high school chemistry teachers, and responded to by ten XII-grade high school students. The final product of this development is an audiovisual-based song education media equipped with various features: 1) containing images, animation, and sound, 2) utilizing applications: BandLab, Ibis Paint x, Flipaclip, and Capcut, 3) using the 2013 Curriculum, 4) presenting two musical arrangements for four song titles in one video (noble gases, alkali metals, halogens, and alkaline earth metals) which are then completed with a quiz, and 5) each song presents the sub-material of abundance, physical and chemical properties, as well as the benefits of elements, 6) using appropriate language styles and supporting sentences in the video, and 7) practical. After being declared valid by content and media experts, the song was assessed for quality by three chemistry teachers with an idealized percentage of 93.33% or an outstanding category. The product was then responded to positively by students with an ideal percentage of 98% or a particular category in all aspects.

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1. INTRODUCTION

Twenty of 2003 of National Education Standard Article 1 states that education is a conscious and planned effort to create a learning atmosphere and learning process so students can actively develop their potential (Hermanto, 2020). The success of a student depends on the learning process experienced by students, including the way the teacher manages the class. Teacher performance is key in learning activities (Winataputra 2003; Muspawi, 2021). A teacher-centered learning approach is still dominant to be applied by teachers even though the minister of education has encouraged teachers to use a student-centered learning approach and emphasized the concept of *Merdeka Belajar* (or Freedom to Learn). This concept explains that teachers and students are a

subject that collaborates as a driver to seek the truth (e.g. knowledge) (Kasmawati, 2021). The concept of *Merdeka Belajar* places teachers and students to work together to find the truth, and uses learning activities to train the critical and reasoning ability of students to see a phenomenon (Yamin & Syahrir, 2020). *Merdeka Belajar* has tried to eliminate the learning activities in which most students tend to be passive and only accept what is conveyed by the teacher. This fact resulting a habit that is embedded in the learning process, that affects the learning goals or targets are not achieved properly (Haryanto, 2020).

On the other hand, chemistry learning aims to develop human resources in intellectual and psychomotor skills in chemistry based on a scientific attitude (Setyawati, 2019). One of the chemistry topics that students learn in high school is the Main Group Elements (Hadeli L et al., 2023). This topic most contains abstract memorization, so students tend to be required to read, understand, and memorize (Isnaini & Purtadi, 2018). Many teachers advise their students to study independently. Based on the preliminary study at some high schools in Yogyakarta, it was found that students felt challenged to study the Main Group Elements because students felt uninterested in reading quite a lot of material. Teachers in schools observed applied lecture methods, presentations, discussions, and scientific writing; however, the learning achievement of the students did not meet the expectation. One teacher also stated that she always provides additional materials and assignments to increase the student's retention of the Main Group Elements. Another teacher mentioned that three of the total students in her class could achieve the Minimum Grade Criteria (KKM) in the topic of Main Group Elements. These facts indicate that teachers need to be more creative to utilize and use alternative learning media that differ from usual to arouse students' interest.

Media is a tool in the learning process (Sadiman, 2007; A. N. L. Putri et al., 2023). Learning media helps visualize abstract teaching materials to make them easier to understand and become an aspect of the success of the learning process (Febriyanto et al., 2019). The generation that was born in the 2000s, or is commonly called the Z generation, mostly has characters that are very profound to the development of information and communication technology, which is a potential for teachers to optimize the use of technology-based media as a way for effective learning (Nur Aisyah et al., 2018). The use of the latest digital technology-assisted learning media, such as smartphone-based learning media, is one of the efforts to answer the challenges of learning in the 21st Century (Kartimi et al., 2019). In addition to adding value to the valuable functions of smartphones and smartphone-based learning media can also improve student academic performance (Fatma & Partana, 2019). Academic performance includes cognitive learning outcomes, learning motivation, and learning independence (Sojanah & Kencana, 2021). Research on the development of smartphone-learning media was carried out by Rahmila et al., (2022) on Colloidal Chemistry, and it can significantly improve cognitive learning outcomes and learning independence of high school students.

According to Bruner in Jufri (2013), knowledge and skills obtained through direct activities will tend to last longer than knowledge obtained through listening activities, one of which is music. However, apart from being enjoyed, music has long been believed to be a proper medium in the background of children's cognitive development (Ningrum, 2022). Several previous studies have shown that music has positive implications for learning. Research conducted by Ridwan & Awaluddin (2019) in applying the singing method in Arabic language learning in early childhood shows that this method has effective results, indicated by the speed of students' memorization and

reflection through singing. Songs can stimulate students to sing along so that the brain will record the tones produced, and the ones recorded can explore the memories associated with these tones. Rokhimah (2019) developed cover song media for high school chemistry lessons on acids and bases and her study resulted in the ideal percentage (82%) on the quality aspect and song-based media helps students' understanding because the lyrics match the material and are very practical to use. Therefore, it can be said that song-based media is effective and positive in supporting the learning process.

Previous studies indicated that music packaged through multimedia positively influences learning. Audiovisual media is included in multimedia, which contains features of sound and images that can be seen, such as video recordings, films, sound, and slides (Nurfadhillah et al., 2021). Muyassaroh & Ardhana (2022) developed audiovisual-based learning media on electrolyte and non-electrolyte chemistry topic, and the results show that the media is suitable for use in the learning process. In addition, the observation of that study demonstrated that students experienced changes in positive attitudes toward learning, increased interest in learning, and more attention focused. These two studies show that learning multimedia can provide meaningful experiences and make it easier for students to understand something abstract to be more concrete. The lesson does not make students bored because this multimedia can activate all senses. Research on song development by Syarifah (2021), which was carried out by combining educational song media and audiovisual-based media on Plant and Animal Cell material, obtained very good validation and was feasible to be applied as teaching material. Combining audio and visual features in the media has increased students' interest in independent learning.

Main Group Elements material is one of the materials that students are uninterested in because students generally have difficulty memorizing (Rahayuningsih, 2017). The Main Group Elements consist of eight groups, starting from the group, namely Alkali Metals (IA), Alkaline Earth Metals (IIA), Transition Elements (IIIA – IVA), Pnictogens (VA), Chalcogens (VIA), Hallogens (VIIA), and Noble Gases (VIIIA). Within each element, there is still another sub-matter, namely physical and chemical properties, so that sometimes students find difficulty in memorizing them or even make mistakes in determining the properties of the elements, such as atomic radius, metalness, reactivity, electronegativity, and identifying the benefits of the elements. Students tend to memorize in a conventional way, namely by reading material repeatedly and often causing boredom (Mahfud, 2018). Therefore, the presentation of audiovisual features is considered to be able to help solve boredom in the learning process (Muttaqien, 2017). The media developed is expected to physically represent real and abstract ideas (Atmaja, 2019). Thus, using singing techniques assisted by video visualization is a suitable activity to attract students' interest and generate creativity and imagination in overcoming difficulties in memorizing the Main Group Elements material.

Learning the elements of the leading group with conventional methods is monotonous for students. As a result, students' interest and motivation to learn decreases. Boring learning affects students' concept understanding. Students who need help understanding the concept of the material have difficulty obtaining maximum learning results. On the other hand, the Primary Group Elements material cannot be understood with a single reading. Moreover, this material is memorized, so direct student involvement in learning helps to remember concepts well. In addition, each element of the leading group has different characteristics. Through reading, students never know the actual form of the element, so more visual media is needed. To fill the gap in

previous research, developing chemistry learning media in the form of educational songs is necessary. This song-based media is expected to help memorize and visualize the main group elements. This learning media offers direct student involvement, hopes to achieve meaningful chemistry learning, and improves student learning outcomes. Theoretically, this song media has implications for further research in developing similar learning media.

2. METHOD

Research & Development (R&D) was the primary approach used to develop audiovisual song-based media. R&D is commonly used to develop or validate products used in education and learning, to produce specific products, and test the effectiveness of these products. This study adopts the 4-D model developed by S. Thiagarajan, which consists of four stages: the Define, Design, Develop, and Disseminate (Trianto, 2014). However, in this research, the method used is limited to the Develop stage due to time and cost constraints, the method design can be seen in Figure 1.

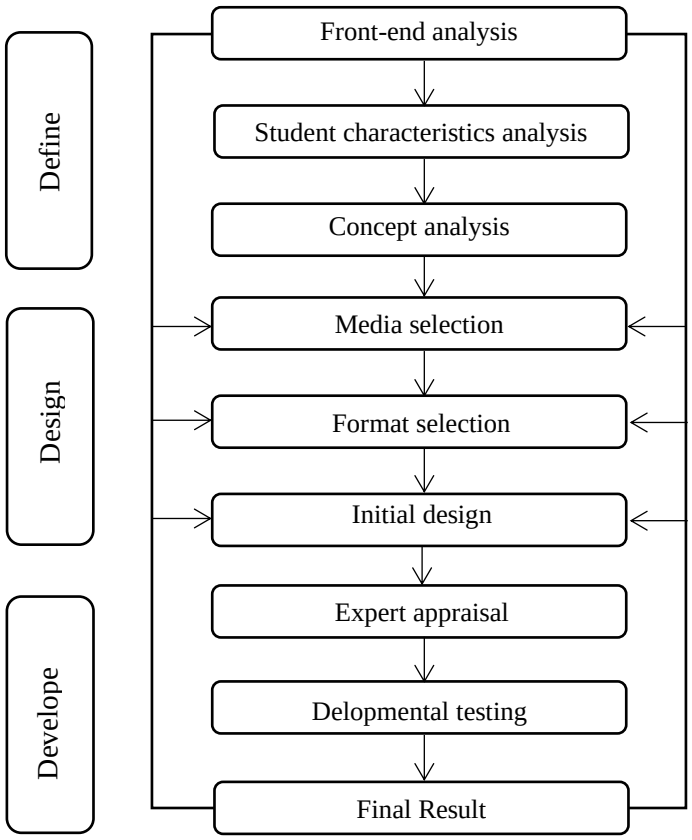


Figure 1. flowchart of 3-D research model

The Define stage was used to analyze the learning requirements, beginning with analyzing the lesson's objectives developed through the teaching materials. This stage includes three steps, namely: (1) front-end analysis; (2) student characteristics analysis, and (3) concept analysis. The second stage is the Design stage, which aims to make a prototype (initial design) of the product to be developed. This stage includes: (1) media selection, (2) format selection, and (3) initial design. The last stage is the Develop stage, which aims to produce a product that has been previously designed; validated by experts, teachers, and end-users/students; and revised before it is claimed

to be feasible with good quality criteria. At this stage, a limited test was carried out on ten students of grade XII who had learned material on the Main Group Elements.

The experts (content and media) and the teachers were provided with validation sheets to validate the audiovisual song-based product. The validation sheet for content experts consists of three aspects (i.e., content, language, and video view) and ten statements, for media experts consists of four aspects (i.e., visual, audio, typography, and music programming) and 11 statements, for teachers consists of five aspects (i.e., media view, media clarity, suitability media with content, ease of use of media, and media attraction) and ten questions. The quality assessment questionnaire is in the form of a multilevel scale with 4 rating categories from the highest, namely: 4 (very good), 3 (good), 2 (poor), and 1 (very poor). The experts offered their reviews, while teachers also provided an assessment to assess the quality of the product. Reviews experts and teachers were used as guidelines to revise the product. After the product was reviewed and obtained good criteria, it was sent to the students to be final checked using a Gform questionnaire. This questionnaire consists of two aspects (i.e., media attraction and student interest) and ten questions.

The data obtained (both qualitative and quantitative) is then processed and analyzed to determine the quality of the product being developed. Qualitative data is data obtained from the results of a questionnaire in the form of reviews and improvements from experts. In contrast, quantitative data is obtained from the assessment scale from teachers and questionnaires from students. Data from the assessment scale are analyzed by the tabulation stage (data recapitulation), adding up the score of each teacher and the maximum total score, then calculating the percentage of product ideality and changing each sub-variable into a sentence that is qualitative in nature with the formula (Riduwan, 2015). The percentage range of this qualitative assessment category is presented in Table 1.

Table 1. Percentage Range of Qualitative Assesment Categories

No	Percentage Range (%)	Category Level
1.	$75 < \text{score} \leq 100$	Very good
2.	$50 < \text{score} \leq 75$	Good
3.	$25 < \text{score} \leq 50$	Poor
4.	$0 < \text{score} \leq 25$	Very poor

The analysis technique for the results of the responses of ten students was carried out by changing the data from student responses in the form of qualitative data to quantitative data using the Guttman scale, which was then calculated using the formula in Table 2.

Table 2. Rules for Giving Student Response Score

Information	Score
Agree	1
Not agree	0

The formula used in calculating the percentage is as below:

$$\overline{X} = \frac{\sum \chi}{N} \quad (1)$$

Information:
$\overline{X}$ = Average score of all aspects of each aspect
$\sum \chi$ = Total score of all aspects of each aspect
N = Number of students

3. RESULTS AND DISCUSSION

A 4-D model used in this research produced a valid and very good category of audiovisual song-based media for Main Group Elements. The final version of the audiovisual song-based media has the extension *.mov,* which can be easily accessed via Google Drive. The audiovisual song-based product contains the Main Group Elements material, which describes each chapter: Noble Gases, Halogens, Alkali, and Alkaline Earth Elements. The content in these songs is associated with the 2013 Curriculum guidelines. All video songs are accompanied by lyrics, explanations, and pictures to illustrate the contents. The audiovisual song-based media for the Main Group Elements is expected to support and overcome students' difficulties in remembering learning material with many memorizations. The following is the development process according to the 4-D model.

3.1. The Define Stage

The *Define Stage* consists of three main steps, *the first* was the front-end-analysis step. This step was conducted by an interview and observations at one high school in Yogyakarta. In the interview, the chemistry teacher mentioned that there were obstacles in conveying the material for the Main Group Elements because there was quite a lot of material while time was limited to pursue the target of chemistry material which must be fulfilled for grade XII. Especially with Covid-19, much time for learning activities has been limited, so teachers feel that the material is not being delivered optimally to students, and students have to study independently at home. The teacher said that she usually would give homework so that students want to re-read the material accompanied by providing a soft file of the materials. The school investigated applied the 2013 curriculum, which means that the material for the Main Group Elements is referred to as Basic Competency 3.7, which contains an analysis of abundance, trends in the physical and chemical properties of elements, and the benefits of the Main Group Elements (noble gases, halogens, alkali, and alkaline earth). These materials are the benchmark in compiling material in learning media. *The second step* was the analysis of student characteristics. Based on observations, students tend to get bored easily if they only listen to the material using the lecture method via PPT slides. Students also feel very bored if they have to read multiple sheets of material files. These facts indicate that it is necessary to develop learning using multimedia. *The third step* is concept analysis. At this step, identification was carried out from the previous analysis results and the formulation of objectives. The material is systematically conceptualized and then given limitations to make it more focused.

3.2. The Design Stage

The next stage is *the Design Stage* making an initial design (prototype) of the product, which was the audiovisual song-based media. This stage was carried out by selecting the media, selecting the format, collecting references, and the initial design. The first step at this stage was the media selection. The media selected was the audiovisual song-based media for high school students for Main Group Elements. The audiovisual song-based media is designed like a video clip for a song with a title format, a series of songs for each sub-material, then ends up with a quiz. After that, a collection of reference material for the Main Group Elements was carried out as material to be used as appropriate song lyrics. The media developed is in the form of making two songs, each used for two kinds of Main Group Elements. This consideration was taken because the song's tone is original; it will sound new to students, so it is intended that students have no difficulty remembering the tone when memorizing the lyrics. The BandLab application was used to record the song, as this application has more complete features than the similar one. The CapCut application was used to edit the video, as this application has features that are very supportive for presenting audio-visual media, such as precision editing, multiple layers, color adjustments, and audio features (Fitriningtyas et al., 2021). In addition, the CapCut application is a free application that is very easy for many people to understand and comprehend (Rahayu, 2022). Then, the Ibis Paint X application was applied to draw animated designs to make the video more attractive. This application was selected because it can be installed for free and is easy to operate with support for complete features such as a ruler feature, the many fonts available, 350 types of brushes, and the video feature (Chusniah & Setianingsih, 2019). The images made are then motioned with the Flipaclip application. This application can help create animated works or moving images. The use of this application is also relatively easy with the provision of drawing tool features, including a brush, eraser, lasso tool, ink tool, and pencil tool (Setiaji, 2020). The images displayed are expected to provide suitable learning motivation and help students observe and understand the explanation of abstract material. In research conducted by Putri et al., (2022) in developing animated video-based chemistry learning media, the students responded well, meaning that using animated videos effectively increases students' motivation in the chemistry learning process. The final step of this Design stage is to make an initial design (prototype) regarding the video design that will be developed.

3.3. The Development Stage

The next stage is the *Development stage* which is the first step in producing a product. This stage includes arranging music and creating video clips regarding the main group material elements arranged sequentially for each sub-material. Each sub-material will explain its abundance, physical properties, chemical properties, and benefits. The following are the process details of the initial product.

3.3.1. Tone

Making a tone is the initial stage in arranging a song which must adjust the character of the music to be chosen to be able to inspire students' enthusiasm for learning. The musical instrument

researchers use to compose songs is a keyboard and the music produced has a piano accompaniment concept. The researcher chose a song with a cheerful rhythm, with the hope that students would not feel bored hearing and learning the song (Aryanto & Megananda, 2019). The researcher also chose chords that were simple but did not leave variations in the harmonization of tones so that the songs were easy to hear and memorize. The songs produced by the researcher were two original songs. Song 1 was used for Noble Gasses and Alkaline lyrics, while Song 2 was used for Halogen and Alkaline Earth lyrics.

3.3.2. Song Lyrics

This stage is a very important as the song lyrics are a message from a song that is conveyed to the listeners. Song lyrics for the elements of this material group consist of noble gas, alkaline, alkaline earth, and halogen sub-materials. Each song lyrics sub-material contains abundance, physical properties, chemical properties, and benefits.

3.3.3. Recording

The tones that have been formed and harmonized with the appropriate song lyrics were then recorded to form a unified song product being developed. The researchers utilized the BandLab application. BandLab is a digital studio workstation that can be accessed for free and is very easy to use for beginners. This app has great features to give you clear recordings and studio effects. Researchers used this application to record, combine music and vocal recordings, as well as audio editing as the final stage of making songs which can be seen in Figure 2.

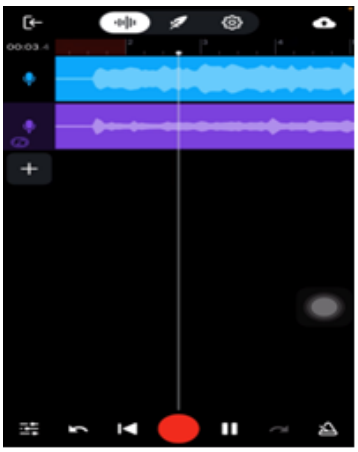


Figure 2. Recording and editing using the BandLab Application

3.3.4. Video Creation

In this process, video editing was carried out by combining the four songs into one video. In the video editing process, selection of the right background, mixing, transitions, font selection, and addition of animated images were carried out. First of all, the researcher prepared an animated image to be embedded in the video clip. The images created were adapted to the material presented with the intention of providing an attractive visualization for the audience. Drawing using the Ibis

Paint X application involves the process of image adaptation, modification, sketching, coloring, and font selection. The example process can be seen in Figure 3.

Figure 3. Drawing using the Ibis Paint X Application

Furthermore, the last version image was animated and moved the image's direction using the Flipclip application. This application can create clips and work on a frame-by-frame principle, as seen in Figure 4.

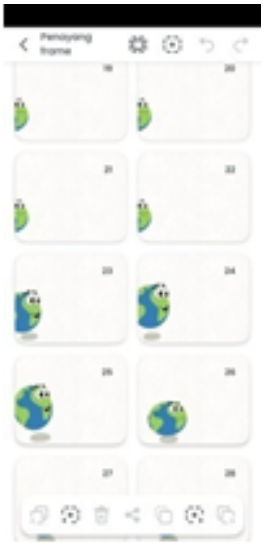


Figure 4. Giving motion to images using the Flipclap Application

The last one was merging all the elements prepared using the CapCut video editing application. The process of editing the video was done by combining the songs and images that were made. Apart from the song lyrics, the video includes a more detailed explanation of the material. The writing layout, transition effects, and font types were made as proportional as possible so that the videos produced could attract students' interest. At the end of the video, the researchers provided a quiz as a student assessment. This was the final step in making audiovisual song-based media for the Main Group Elements material, as seen in Figure 5. Then the initial results of this product can be seen in Figure 6.

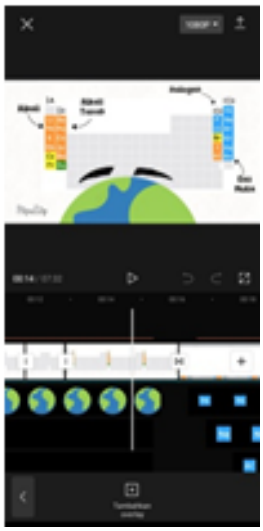


Figure 5. Editing process using the CapCut Application

Figure 6. Draft 1 Audiovisual-Based Education Song Learning Media

The pre-final edited product was Draft 1, which was then asked for reviews by peer reviewers. The feedback obtained was accommodated and considered in product improvement, producing Draft 2. Furthermore, the product was then validated by experts (i.e., content and media experts). This validation aims to produce audiovisual song-based media that is valid for trials. The content experts assessed the Main Group Elements material aspects used in the songs and videos. The results of product quality validation by content experts are in Table 3.

Based on the validation by material experts, two indicators are not yet valid, namely the depth of the material and the clarity of the video. The product is said to be invalid because the material expert provides input to pay more attention to the depth of the material content so that it is not only limited to explaining in general, such as what percentage of noble gases exist in nature and why noble gases are stable. Overall, this medium is included in the excellent category, but there are some suggestions to improve its quality

Table 3. Product validation results by content epert

No.	Assessment Aspects	Indicator	Information
1.	Content Material	The depth of the material is in accordance with the needs of teaching materials	Invalid
		Ease of material to learn and understand	Valid
		Suitability of the material with competence and learning objectives	Valid
2.	Language	Correct spelling of the applicable language General Guidelines for Indonesian Spelling (PUEBI)	Valid
		Appropriateness of language style with student characteristics	Valid
		Appropriate use of chemical terms	Valid
		Integration of sentence formation	Valid
		The simplicity of language has no double meaning	Valid
3.	Video View	Clarity of information on the video displayed	Invalid
		The suitability of the video with the material concept of the main group elements	Valid

The researcher added supporting information in the video to explain the ongoing lyrics further. This revision is a follow-up to the results and suggestions for improvement by the experts because the depth of material is an urgent matter in the learning media component. In this way, the media can minimize the information gap for users wherever they are (Afandi, 2022). Meanwhile, media experts validated the product using the visual, audio, typography, and music programming aspects adapted and modified by Syarifah (2021). The results of validation by media experts can be seen in Table 4.

Table 4 shows that one indicator is declared invalid, namely regarding the clarity of articulation in the audio aspect of the media. The feedback for improvement was that some parts of the sound needed to be more visible. The results obtained became the consideration of the researcher to evaluate the song's audio. The media experts found that there was noise in some parts, so some of the pronunciation of the sentences could not be adequately heard.

Table 4. Product validation result by media experts

No.	Assessment Aspects	Indicator	Information
1.	Visual	Power visual appeal	Valid
		Visual connectedness support clarity draft	Valid
		Quality video view	Valid
2.	Audio	Clarity voice	Valid
		Appropriate composition of the song in bring expression song	Valid
		The selected melodic fascination with rhythm music	Valid
		Clarity articulation	Invalid
3.	Typography	Clarity size and type fonts in subtitles	Valid
		Typographical accuracy used in videos	Valid
4.	Music Programming	Ease of use and operation media	Valid
		Ease of access media (can saved on software or hardware)	Valid

This was followed up by re-taking and editing the audio because it might result in students' misperceptions of the material. However, overall, the product was declared by the media experts to be feasible for trial.

Lagu Pertama
Gas Mulia (*song*1)

Unsur golongan utama, unsur yang paling banyak di bumi
Alkali, Gas Mulia, Halogen dan Alkali Tanah
*) Gas mulia punya macam-macam unsurnya
Helium, Neon, Argon, Krypton, Xenon, dan Radon
Ada dua macam ciri-ciri unsur, ciri fisika dan ciri kimia
Sifat fisika bersifat non polar sedikit larut dalam air

*) Tidak berwarna tidak berbau tidak berasa sbagai gas monoatomic
Titik didih lelehnya sangat rendah karena gaya londonnya sangat lemah
Sifat kimia sangat inert, gas mulia kereaktifannya rendah
Konfigurasi elektronnya sudah setabil
Helium pengisi balon udara, juga campuran oksigen pada tabung penyelam
Neon tuk lampu reklame, lampu bandara
Cahayanya mampu menembus kabut

Figure 7. Noble Gases Elements Songs Lyrics

Lagu Kedua
Alkali (*song*1)

Unsur logam alkali golongan 1A periodic unsur
Litium, Rubidium, Natrium, Kalium, Sesium, Frensium

*) Bersifat sangat reaktif, membentuk basa-basa kuat larut dalam air
Daya reduktor kuat mudah teroksidasi
Dapat bereaksi dengan halogen, dapat bereaksi dengan hidrogen
Khusus untuk Li bisa dengan nitrogen, dapat bereaksi dengan air

*) K, Rb, dan Cs akan meledak jika dimasukkan ke dalam air
Bereaksi dengan oksigen membentuk oksida, peroksida, superoksida
Sifat fisika logam alkali bersifat lunak sebagai konduktor yang baik
Titik didih lelehnya ke bawah smakin rendah
Kelogamannya lebih kuat dibandingkan dengan alkali tanah
Litium tuk batrai telepon
Natrium klorida garam dapur kalium tuk pupuk

Figure 8. Alkaline Elements Songs Lyrics

Lagu Ketiga
Halogen (*song*2)

*) Unsur halogen unsur golongan tujuh A
Fluorin Klorin Bromin Iodin dan Astanin
Unsur golongan halogen sangat reaktif
Halogen merupakan pembentukkan garam
Sifat kimia halogen kereaktifannya dari F ke I semakin berkurang
Daya oksidator kuat, dapat bereaksi dengan basa membentuk garam
Bereaksi dengan hydrogen memebentuk asam
Reaksi drngan air reaksi autoredoks
*) Sifat fisika sbagai molekul diatomic
Umumnya berbau dan menyengat dan menususk
Titik didih lelehnya relatif rendah
Bertambah dari unsur Fluorin ke Iodin
Mudah larut dalam air kecuali iodin
Kerapatannya bertambah dari F ke I
Fluorida gas kuning muda, klorin gas hijau muda
Iodin padatan ungu muda, bromine cair merah kecoklatan
Fluor digunakan pada bidang industri
Klor digunakan dalam pembuatan PVC
Bromin digunakan sebagai zat pewarna
Iodin zat antiseptik emulsi fotografi

Figure 9. Halogen Elements Song Lyrics

Lagu Keempat
Alkali Tanah (song2)

*) Unsur alkali tanah golongan dua A
Be Mg Ca Sr Ba dan Ra
Sifat fisik unsurnya relatif lunak
Lebih keras dibanding logam alkali

Barium bersifat keras seperti timbal
Reaktif meski pada suhu tekanan standar
Konduktor yang baik bereaksi dengan air
Membentuk alkali oksida kuat
Densitas titik leleh didihnya relatif rendah
Jari-jari atom lebih kecil dari alkali

*) Sifat kimianya relatif mudah bereaksi
Dari Ba ke Be semakin turun
Bereaksi dengan udara dan halogen
Bereaksi dengan air kecuali Be
Jika dipanaskan bereaksi dengan hidrogen
Membentuk senyawa alkali halida

uji nyala dengan menggunakan api
Be putih magnesium putih cemerlang
Ca merah bata Sr merah crimson
Barium warna hijau apel Ra merah crimson
Mg digunakan sbagai obat maag
Ca digunakan sbagai pengekstraksi logam

Figure 10. Alkaline Earth Elments Songs Lyrics

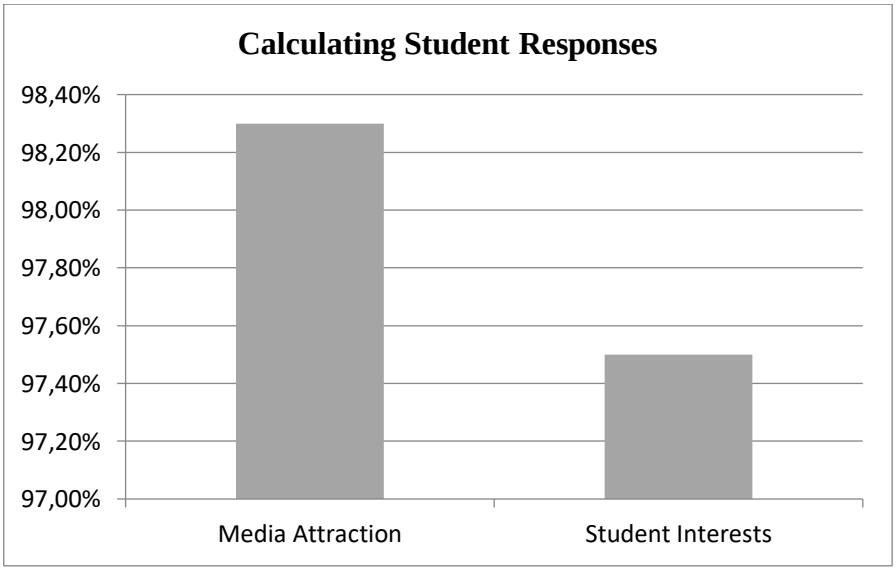
The audiovisual song-based media that was validated and revised was then produced as Draft 3 (see Figures 7, 8, 9, and 10), which was then subjected to a quality assessment of three chemistry teachers. The data from the three teachers was then analyzed by calculating the scores obtained to get the percentage of the ideal product. The results of the product quality assessment by three chemistry teachers are presented in Table 5.

Table 5. Assessment of product quality by chemistry teachers

No.	Assessment Aspects	Ideal Percentage (%)	Category
1.	Media view	89.58%	Very Good
2.	Media clarity	95.83%	Very Good
3.	Suitability media with matterial	100%	Very Good
4.	Ease of media use	100%	Very Good
5.	Media attraction	83.33%	Very Good

Based on the overall product quality assessment calculation results, the audiovisual song-based media is categorized as very good with an ideal percentage of 93.33%. Based on the analysis of each aspect of the media quality assessment, it is known that the highest percentage is in the suitability of the material and ease of use of the media by 100% of the ideal percentage. If the media is suitable for the material displayed, this product can help teachers explain the learning material. This finding aligns with research conducted by Mu'minin & Humaisi Field (2021), which states that audiovisual media makes it easier for teachers and is suitable for developing student learning motivation. Another aspect that obtained a 100% ideal percentage is the ease of media use; this assessment indicates that audiovisual-based media is effective as learning media. This finding is similar to research conducted by Perbawa et al., (2020), mentioning that smartphone-based learning media were responded to very positively by students, so it is highly recommended that teachers use technology, such as smartphones, as learning media.

The last step in the Development stage was the limited review phase on ten grade XII students as the end-user to determine the students' responses to the developed media. This review includes two aspects, i.e., media attraction and student interest, as seen in Graphic 1.



Graphic 1. The results of calculating student responses to the media

Based on the analysis of each aspect, the response was very positive, indicating that the attractiveness of the media was 98.3%, and the student's interest was 97.5%. Overall, it can be concluded that the audiovisual-based education song learning media of the Main Group Elements is categorized as Very Good with an ideal percentage of 98%. Most of the students stated interest in this media because the product is felt to be very helpful in studying the material of the Main Group Elements, which are quite a lot. Based on the student responses, two students stated that they disagreed with the indicator that after using this media, students felt they could master the material better. This media cannot help students understand or memorize material instantly, but it can help if students play videos repeatedly in their learning activities.

According to research conducted by Putra (2022) , there are challenging factors that influence the success of using audiovisual media itself, namely the students themselves, the conditions and readiness of the students differ from one another, and the lack of interaction from the teacher. However, this audiovisual song-based media can be used as an alternative learning media because it has good appeal in attracting students' interest in learning the material of the Main Group Elements. This is confirmed by research conducted by Golu (2016) that using audiovisual media can increase students' interest in learning and help students to understand the material. Apart from that, another fact in Putri et al.'s (2022) research proves that using songs is quite effective for memorizing skills, making it easier for students to understand and learn objectives.

4. CONCLUSION

An audiovisual-based educational song media has been successfully developed on the Main Group Elements material which has the following characteristics: 1) a combination of images, animation, and sound, 2) made with the help of several applications including BandLab, Ibis paint x, Flipaclip, and Capcut, 3) the material presented is in accordance with the 2013 Curriculum,; 4) presents two musical arrangements for four song titles in one video (Noble Gases, Alkalis, Halogens, and Alkaline Earth Metals) which then ends with a quiz, and 5) each song presents sub-materials of abundance, physical and chemical properties, and benefits of elements, 6) uses language styles and sentences that are appropriate and support the video, 7) is practical to use, and 8) has an attraction to increase student interest in learning. The product was validated by material experts and media experts with some input for improvement so that the product was suitable for field testing. The teacher as a product reviewer rated this product with a very good category with an ideal percentage of 93.33%, and students gave a positive response with an ideal percentage of 98%.The positive response from students was shown by positive comments that the media developed was able to foster interest and help them in learning the Main Group Elements material. Thus, the development of song-based educational audiovisual has successfully attracted students' interest and can be used as an alternative learning media for students at school and independently. This research is expected to encourage teachers to use and develop fun learning media in the learning process at school.

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