

Chemo-Entrepreneurship (CEP) Essentials: Practical Videos on Functional Group Material via YouTube

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Abstract

Entrepreneurship is crucial for students to navigate intense competition in the globalized era. Chemo-entrepreneurship (CEP) integrates chemistry education with the production of marketable products, which can serve as practical videos to illustrate the application and relevance of functional group materials in daily life, making chemistry learning more impactful when applied practically. This research aims to develop YouTube content in the form of practical videos on functional group material containing chemo-entrepreneurship. The method used in this research is research and development (R&D) with a define, design, develop, and disseminate (4-D) model. The products developed are assessed by material, media, and educational practitioner experts using product quality assessment sheets and student responses. The percentage of assessments from material, media experts, and reviewers are 87, 96, and 91%, respectively. Students responded positively to the practical video that was developed and obtained a percentage of 97%. Assessments from experts, reviewers, and students are in the very good category. Based on the data obtained, the practical video developed is suitable for use as an alternative media in practical learning of functional group material to improve students' entrepreneurial spirit.

Keywords: chemo-entrepreneurship, content creator, functional group, YouTube

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1. Introduction

Content creator is one of the promising professions in the 21st century (Soentanto & Tampubolon, 2022). Content creator Initially, it was only seen as a hobby, but now it has become a popular profession (Paramesti et al., 2021). A content creator is someone who contributes to the delivery of information in various media, both print and digital (Salsabila, 2021). Content creators provide opportunities for people to express themselves through their work and earn income through endorsements and campaigns (Herari & Waluyo, 2023). Content creator has become a profitable job for other people because it can open up job vacancies such as editors, photographers, and

production teams (Gora et al., 2023). Apart from that, becoming a content creator will increase a person's creativity because they are required to express their ideas. Creative ideas in each content (Gogali & Tsabit, 2021). A content creator must make a piece of content, whether in the form of writing, images, sound, or video, which is then uploaded to social media to earn income (Putra & Febrina, 2019). One of the free social media that can be used to upload content is YouTube (Pranartha, 2021).

YouTube made an impact that was revolutionary in the form of a broadcasting model, which was initially limited to television media and became wider with the form of online media (Istiani & Widhiyatmoko, 2020).

YouTube is one of the social media forms of video where users can upload, watch, and share various kinds of videos online for free (Mujianto, 2019). YouTube can be accessed by anyone, anytime and anywhere, with an internet connection (Wibawa, 2019). Through YouTube, someone is free to create, experiment, and argue (Praliansyah, 2021). YouTube provides opportunities for its users to make money and opens up opportunities for perpetrators' efforts to advertise in user videos (Nur'aini, 2021). Previous research results show that the majority of content creators use YouTube as a means of channeling creativity and a space for self-expression so that they can interact with other people and gain benefits in the form of material and popularity (Tisa, 2023). The YouTube trend started to spread in 2014 and gave rise to much content ranging from entertainment, news, and politics to education (Amalliah & Yunita, 2020). However, most of the content currently available is negative and pollutes the audience's mindset (Indrianingsih & Budiarsih, 2022). Currently, entertainment content with minimal education still dominates the majority of content circulating (Kusuma, 2020). One way to minimize the impact of negative content is to present a lot of positive content, such as educational content (Hidayati & Anggraini, 2022).

Educational content that can be created via YouTube has three main categories, which are: (1) edutainment, which combines education with entertainment to present learning that is creative, innovative, and easy to remember; (2) education in the form of academic or curriculum-based lessons guided by teachers or experts, and (3) skills-based learning to direct and improve careers guided by professionals (Hasanah et al., 2021). Educational content containing learning materials on YouTube channels is used as a medium for conveying information and making it easy for students to explore the material (Cahyono & Hassani, 2019). Educational content containing learning materials is one of the interactive media that becomes a bridge for teachers and students (Suradika et al., 2020). However, the reality on the ground shows that there is still very little

educational content on YouTube. One of the content lessons that is important to develop to support learning is chemistry content.

Material tends to be abstract and difficult to understand (Hemayanti et al., 2020). Therefore, learning resources or media are needed to support chemistry learning (Purwoko et al., 2021). Chemistry as a product includes a collection of knowledge consisting of facts, principles, concepts, theories, and chemical principles, while chemistry as a process includes the skills and attitudes possessed by scientists to obtain and develop chemical knowledge (Anggraini et al., 2022). Students can achieve chemistry as a product and process, one of which is through practical activities (Nining et al., 2023). Chemistry is a science based on experiments, so it cannot be separated from practicum (Eliyarti et al., 2020). Chemistry learning that only focuses on theory without practice will tend to be boring and less interesting, so students think that chemistry lessons are difficult (Sari, 2024). Therefore, a combination of theoretical and practical learning is needed, especially in chemistry learning in high school (Suyanto, 2023). However, facts in the field show that some schools have not implemented practicum optimally due to limited space, time, and teacher competence (Damayanti et al., 2019). The biggest inhibiting factor for practicum is the lack of time at school (Rudini & Khasanah, 2022). Practical video content on YouTube can be one way to overcome limited practicum time at school (Wicaksono, 2022).

The existence of practical videos allows the material to be visualized, and students can practice recognizing laboratory equipment and materials (Fitriyah, 2021). Implementing practicum via video can reduce dependence on space and time because it can be carried out for several classes at the same time (Helsa et al., 2022). Practicums in video form allow them to be played back and slowed down so that they are easier to understand, even though the process is complex and takes place quickly (Ike, 2022). The message delivered via video can have a strong emotional influence and can achieve results quickly compared to other media because it can depict practical

work in a real way (Hasan & Larumbia, 2021). The use of practical videos in learning can improve student learning outcomes and make it easier for students to understand the material (Ardiman et al., 2021; Putri et al., 2021). Therefore, it is necessary to develop practical videos in an effort to optimize students' practical knowledge and skills (Hardyanto et al., 2022). Developing a chemistry practicum video is important to produce a video that is suitable before being distributed as a practicum guide for students (Umar et al., 2023). However, currently, the chemistry practicum videos available on YouTube are not yet in line with practicum needs in schools, such as functional group material.

Functional groups are a type of chemical material that has abstract properties (Setiawan, 2022). Functional group material is considered difficult for students because many nomenclatures, isomers, and reactions need to be understood (Aprylina, 2022). Functional group material is a material that is often considered difficult and has a very broad scope (Qodriyah et al., 2020). Usually, students only memorize functional group material without understanding it (Jannah et al., 2023). Interviews with high school chemistry teachers in Yogyakarta show that students still have difficulty linking functional group material with applications in everyday life (Rahayu et al., 2022). Some products produced from functional group materials include motorbike shampoo, aromatherapy candles, and transparent soap (Wijayanti, 2023). This product can be used as a practical video to provide students with knowledge about the application and connection of functional group materials in everyday life. Chemistry learning, when applied in everyday life, will be more meaningful (Jannah et al., 2019). One approach that can be used to make chemistry more meaningful and useful for students' lives is CEP (Lestari, 2019).

CEP is a chemistry learning approach that links the material being studied with the manufacture of products that have marketable value. (Kurniawati et al., 2021). The CEP approach emphasizes that students learn the

process of processing material into a product that is useful and economically valuable, thereby motivating them to become entrepreneurs (Annisa & Sari, 2021; Saselah, 2021). Through the CEP approach, it is hoped that students will gain the provision to be more creative in producing products that have economic value (Rahayu, 2022). The CEP approach makes chemistry learning more varied and less boring and gives students the opportunity to optimize their potential for entrepreneurship (Fuadah, 2023). This CEP approach is also very suitable for schools during practicums to develop students' potential and increase students' interest in entrepreneurship. (Andrean et al., 2019). Apart from that, the CEP approach in learning activities can create a more active and enjoyable learning atmosphere (Safriani & Lazulva, 2021).

Based on the description above, the research aims to produce a practical content creator video on functional group material containing CEP. The practicum video content developed can be a guide for students in carrying out practicums and cost planning so that an appropriate selling price is obtained. It is hoped that this practicum can increase enthusiasm and inspiration for students to become entrepreneurs in the field of chemistry. Apart from that, the practical video developed can be used as an alternative media for teachers to explain the benefits of functional group material in everyday life.

2. Research Method

This research is of the type of Research and Development (R&D). R&D is a type of research used to produce certain products and test their feasibility and effectiveness (Elvarita et al., 2020). The product developed in this research is in the form of practical video content on functional group material containing CEP via the YouTube channel. The development procedure uses a 4-D model (define, design, develop, disseminate) (Mahsunah & Shobah, 2022). The 4-D model was chosen because the description is simple,

systematic, and easy to understand (Rukmi & Perdana, 2023).

The first stage is defined. Activities carried out include analysis of needs, availability, curriculum, and materials. The second stage is design, which includes determining the product to be developed, formatting, material preparation, initial design, and creating an assessment instrument. The third stage is development. At this stage, the researcher assesses the product and sends it to experts. The fourth stage is dissemination, which is spreading the word about the product being developed.

This research used 4 research subjects, which are material experts, media experts, reviewers (high school chemistry teachers), and 12th grade high school students. Each expert numbered one person, while the reviewers and students numbered four and 30 people. The Likert scale and Guttman scale are used to assess product quality and student responses.

The scores obtained from experts and reviewers are calculated according to the Likert scale formula. Next, calculate the average value of each and all aspects of the assessment from the scores obtained using formula (1):

$$\bar{X} = \frac{\sum x}{n} \quad (1)$$

Furthermore, the calculation results are then categorized according to the reference ideal assessment criteria as in Table 1.

Table 1. Ideal Assessment Criteria

Score range	Category
$x \geq \bar{x} + 1. S_{Bi}$	Very good
$\bar{x} + 1. S_{Bi} > x \geq \bar{x}$	Good
$\bar{x} > x \geq \bar{x} - 1. S_{Bi}$	Not enough
$x < \bar{x} - 1. S_{Bi}$	Very less

Student response scores are calculated using the Guttman scale reference. Next, calculate the percentage of ideality for each aspect and all aspects using formula (2):

$$\% = \frac{\text{Achieved score}}{\text{Maximum ideal score}} \times 100\% \quad (2)$$

3. Result and Discussion

The product resulting from this research is YouTube content in the form of practical videos on functional group material containing CEP. The videos developed are presented with an attractive appearance to increase students' knowledge and entrepreneurial spirit. This research uses the 4-D method, which describes each stage as follows:

3.1. Define

The define stage aims to define and establish the required instructional requirements. The activities carried out include four stages, which are needs analysis, availability analysis, curriculum analysis, and material analysis. Stages one and two were carried out through open interviews with four chemistry teachers. This interview aims to identify problems during learning and the media needed by teachers to support theoretical and practical learning. Based on the results of the interview, information was obtained that the implementation of practical work on functional group material was not optimal due to limited time at school. Teachers usually only explain material theoretically without practical work. The only media used in the functional group material is PowerPoint. In fact, it is not enough to understand the material and relate chemistry to everyday life through theory. There needs to be a bridge to help students relate the material to applications in everyday life. One approach that can be used is CEP.

Curriculum analysis and material analysis are carried out in accordance with the applicable curriculum. Then, prepare a concept for the material that will be included in the video. After that, formulate goals so that the material is more focused. The material used in this research is functional groups.

3.2. Design

The step taken at the design stage is to determine the media that will be developed according to the results of the analysis at the define stage. The media developed by researchers is a practical video containing CEP

on functional group material. Practical videos developed by researchers are uploaded to YouTube. Chemistry teachers can also develop similar videos for other materials. The video functions as a guide for students and teachers in carrying out CEP-based practicums, as well as a cost design analysis so that the selling price is obtained as expected. This process is useful for students to foster inspiration and entrepreneurial spirit through chemistry practicum.

Making a video begins with pre-production, which are making a storyboard and writing a video script. A storyboard is a sketch to describe the sequence of scenes to be recorded (Firmansyah & Pramono, 2022). Meanwhile, video scripts are made to describe scenes in the video (Gugat et al., 2023). Next, create a YouTube channel and design a channel logo and thumbnail. Thumbnail should contain words that make people curious and relevant images. The use of bright colors is also a special attraction for the viewers. Logo and thumbnail created using the Canva application, as shown in Figure 1.



Figure 1. Logo and Thumbnail Design

The first stage is preparing the raw video, saponification reaction material, and esterification reaction material that will be included in the video. The saponification reaction involves fatty acids and bases that produce soap and glycerol (Djoru & Neonufa, 2023). Meanwhile, the esterification reaction is the reaction of a carboxylic acid with alcohol to form an ester compound (Roosdiana, 2022).

The second stage is to create the material scene. Animated characters were created using the Zepeto Application. Zepeto provides many animated characters, and users can choose according to their needs, from face, body shape, and clothing to body language.

Next, the animation was edited using the Capcut application by changing the background and adding text and stickers, as in Figure 2.



Figure 2. Material Scene Editing Process

The third stage is practical raw video editing using the CapCut application. Editing is done by creating a template first, then adjusting the video in terms of duration and speed, and adding text and stickers to the video. The editing process can be seen in Figure 3.



Figure 3. Raw Video Editing Process

The fourth stage is the screen recorder using the CapCut application. The CapCut application was chosen because the sound it produces is good, and there are features to reduce noise. The final stage is finishing, which is merging all the videos from start to finish using the CapCut application. At this stage, animations, stickers, font selection, colors, and animation and transition effects are added. Using effects in CapCut produces more interesting videos.

This research is in the form of practical YouTube video content. The practical video developed consists of three parts; opening, content, closing. Opening, which contains channel branding, intro, video title, and opening footage. Transition effects, colors, layout, and typeface are made as attractive.

The content section contains three scenes, which are material, practical activities, and cost planning. The material scene contains saponification reaction and esterification reaction material. The scene material is shown in Figure 4.

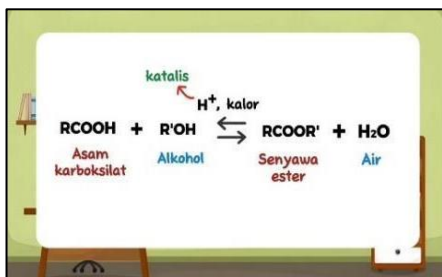


Figure 4. Material Scene Part

The practicum scene consists of three parts, which are practicum objectives, tools and materials, and practicum work steps.

The cost design scene consists of estimates of material prices, production costs, selling prices, profits, and income, as shown in Figure 5.

Hasil		Laba = hasil - modal	
2 botol : 2 x 250 ml	= 11.000		
1 botol : 5.500	= 3.500		
	11.000	1 botol = 1.750	
		100 botol = 100 x 1.750	= 175.000

Figure 5. Cost Planning Scene

Closing is the closing part of the video which contains quotes, credits, behind the scenes, and thanks. The final stage was uploading the video to YouTube. The practical video that has been developed is uploaded to the YouTube channel with the aim of disseminating it. Videos are uploaded by adding descriptions, keywords, and hashtags related to the content to make them easier to find.

The next activity is making research instruments. The product quality assessment instrument contains several aspects that experts and reviewers will assess. Meanwhile,

the student response sheet only contains several statements with yes or no answers. Student response sheets were created with the aim of knowing student responses to the products that have been developed. Before being handed over to students, the instrument is first validated by experts.

3.3. Development

Products that have been developed are then assessed by experts and reviewers. Material experts assess aspects of content, language, and CEP. Media experts assess video aspects (presentation and typography). Reviewers assess aspects of content, language, CEP, and video (presentation and typography). Next, the product developed is implemented in learning, and students' responses are asked for. The results of the assessments from experts and reviewers can be seen in Table 2.

The assessments from material and media experts, reviewers have a percentage of 87%, 96%, and 91% in the very good category. The very good category is obtained through calculations using the likert scale formula, then the results are classified based on Table 1. Therefore, videos are suitable for use as alternative media in practical learning. This result is in accordance with the research results of Ridha et al. (2021), which state that practical videos can be used as alternative media because they have a positive impact on student learning outcomes and understanding. The positive impact of practical videos can also be seen on students' interest in learning (Mu'minah, 2021). The positive impact of practical videos can also be seen from research conducted by Anam et al. (2021), which found that the use of practical videos as an alternative learning media is more effective and efficient and makes it easier for teachers to deliver the material. The student response to the practical video developed was 97% in the very good category. Students responded positively because the practical video presentation was interesting and contained useful content.

Table 2. Research Result Data

Assessment/ Response	Assessment Aspect	Σ Score	Σ Ideal Maximum Score	Ideal Percentage	Categories
Materials Expert	Material	14	15	87 %	Very Good
	Language	5	5		
	CEP	8	10		
Media Expert	Presentations	19	20	96 %	Very Good
	Typography	8	10		
Reviewers	Material	13	15	91 %	Very Good
	Language	4	5		
	CEP	9	10		
	Presentations	20	20		
	Typography	9	10		
Students	Presentations	20	20	97 %	Very Good
	Practicum	19	20		
	CEP	18	20		
	Material	20	20		
	Benefits	19	20		

The video content developed is almost the same as practicum video content in general; the difference is the CEP content. Entrepreneurship is very important in the era of globalization, so it needs to be instilled in the younger generation. The relationship between video making, practicum content, and CEP can be seen in Figure 6 below.

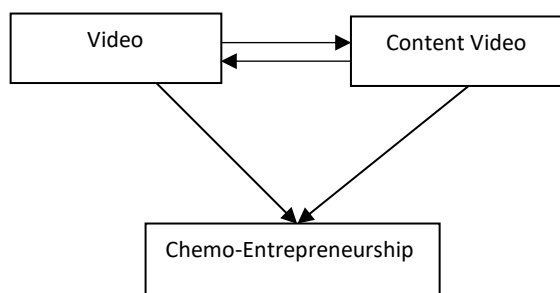


Figure 6. Relationships Between Video, Video Content, and Chemo-Entrepreneurship

Videos and video content have a close relationship. Video is a form of content consisting of moving images and sound, while video content can be in the form of text, images, audio, or a combination of the three that explains or discusses the video. The video serves as a tool to promote and explain the concept of CEP. The video content contains

information about what CEP is, how to start it, and the chemistry practicum containing CEP.

One of the characteristics of CEP is creating products that have selling value (Dewi & Muna, 2022; Kurnia et al., 2022; Ni'mah & Kamaludin, 2023). Video content can be used as a tool to educate and inspire students in entrepreneurship. Another characteristic of CEP is that it relates chemical concepts to real life around us (Dewi & Mashami, 2019; Wijayanti, 2023). The characteristics can be seen in the video which includes making soap and perfume using saponification and esterification reactions.

The content developed is presented with an attractive design so that the audience does not feel bored. The language used is easy to understand and can be accepted by all groups because, apart from students, this content can also be seen by the general public. Practical video content is uploaded to the YouTube channel with the aim of opening people's insight into the real-life applications of chemistry and educating them about business opportunities that can become a source of income through chemistry. The development of practical videos has been developed by researchers including (Dewi, 2020; Husna & Habibati, 2023; Muthiasari & Muna, 2023).

3.4. Disseminate

The dissemination stage includes three main stages: validation testing, packaging, and diffusion and adoption. The product is distributed to the right target, which is 12th grade SMA/MA students. Product packaging is done using Google Drive and YouTube. Products are disseminated to be absorbed (diffusion) and utilized by others (adoption).

4. Conclusion

This research develops a product in the form of practical chemistry video content on functional group content containing CEP, which demonstrates how to make soap and perfume correctly based on saponification and esterification reactions. The percentages obtained from material experts, media experts, and reviewers were 87%, 96%, and 91%. Responses from 30 high school students showed positive results, with a percentage of 97%. Practical content on functional group material containing CEP can be used as practical learning improvisation. Practicums do not have to be carried out at school but can be done independently at home. The content that has been developed needs to be tested in a large-scale learning process to find out the advantages and disadvantages of the video.

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