



Development of Case Method-Based Modules to Enhance Critical Thinking, Creativity, Communication and Collaboration Skills (4Cs) in Disaster Management Students

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Abstract. The ability to think critically, creatively, communicate and collaborate (4Cs) equips students to be ready to face disasters, with the knowledge and ability to act quickly, precisely and effectively. This skill supports students to play an active role in making positive contributions in emergency situations in the surrounding environment. 4Cs skills can be trained through learning based on the case study method presented in the disaster management lecture module. This research was conducted to design, validate and test the usability of a case study method-based module that can improve students' 4Cs skills in disaster management. This study employs a Research and Development (R&D) approach using the ADDIE model, which consists of several development steps, namely: (1) Analysis, to understand existing needs and conditions before designing the module, (2) Design, by designing the module in detail and ensuring that the material prepared is in accordance with the learning objectives, and (3) Development, namely developing modules based on the designs that have been created. The research sample consisted of 30 students taking environmental science and disaster mitigation courses. The research instrument consists of a validation sheet, an observation sheet to assess students' 4Cs skills, as well as a practicality questionnaire with descriptive data analysis techniques. The module feasibility test stage is carried out through product validation by two experts. Based on the research results, it was concluded that this case study method-based module is valid, practical, and can enhance students' 4Cs skills, making them applicable in the learning process.

Keywords: Module, *Case Method*, 4Cs, Disaster Management

1 Introduction

In an era of globalization that continues to grow rapidly, universities are faced with the challenge of producing graduates who not only master theoretical knowledge but also have practical skills that are relevant to the needs of the world of work. One of the skills that is really needed is the 4C skills, namely the ability to think critically, creatively, communicate and collaborate (4C Skills) [2][3]. These skills enable students to deal with complex problems in innovative and effective ways [4][6][7]. For this reason, it is important for universities to adopt innovative learning approaches that can develop students' 4C skills. Learning based on active methods, such as case studies, collaborative projects, or problem-based learning, can provide direct experience and facilitate students in honing these skills. By integrating 4C skills in curriculum and learning, universities can produce graduates who not only have academic competence, but are also able to adapt and contribute positively in the professional world and society.

The development of lecture modules is one of the learning innovations that lecturers can carry out to make it easier for students to learn [5]. Innovative lecture modules can help students understand the material while developing their skills, including 4C skills. Lecture modules can support the principles of the MBKM curriculum by encouraging students to learn actively and independently. Modules designed using project-based methods, case studies, or problem-based learning can create opportunities for students to actively engage in the educational process, both on and off campus [5]. The provision of lecture modules is still limited, and usually the modules used only contain certain theories without paying attention to learning activities and skills that must be achieved [9]. The results of observations of the teaching materials used by lecturers in Environmental Science and Disaster Mitigation courses, especially disaster management material, also show that the teaching materials used during lectures still focus on the material, not using close cases. to the surrounding environment and does not include learning activities that train students' 4Cs skills. Providing teaching-based materials that can practice 4Cs skills is very important to be able to provide the latest learning variations and facilitate students' comprehension of the learning materials that are directly related to the conditions of the surrounding environment. Therefore, it is necessary to develop lecture modules that can train and improve students' 4C skills.

The development of this lecture module must of course be adjusted to the university curriculum. In the initial development stage, the curriculum analysis stage is very important and is used as a basis for developing learning products that are in accordance with curriculum needs. The Independent Learning Independent Campus (MBKM) curriculum in higher education recommends learning based on case method in lectures. Case Method is a learning method that accommodates learning and prioritizes Student Center Learning (SCL) in problem solving [10]. Learning-based case method This can stimulate students' thinking skills in problem-solving [12]. Case method can also improve skills, such as critical thinking skills [8], communication, collaboration, and creativity [1][3]. Use case method is very important and learning activities with this

method can be applied using modules based on case method. Use of modules that contain cases that is close to the environment can be an alternative learning used by lecturers to train students' 4Cs skills. Through this learning, students practice their critical thinking skills on problem solving, creativity in making products or works, collaboration in groups and communication from competitive debate activities.

This research aims to develop a case method-based module on disaster management materials to improve students' 4C skills. Students can practice critical thinking, creativity, collaboration, and communication skills through the use of case method-based modules.

2 Research Method

The research was conducted on the University of Riau campus in January-June 2024. This research is a Research and Development (R&D) study employing the ADDIE (Analyze, Design, Develop, Implement, and Evaluate) model. In this study, only research was carried out until the development stage. The tools employed in this study included validation forms, observation sheets for 4C skills, response questionnaires, and cognitive assessments. The Validation Sheet consists of 3 aspects, namely the module format and graphics aspect, the language aspect, and the content aspect. Product validation was carried out by 2 validators consisting of media expert lecturers and material expert lecturers. The first limited trial was carried out to 30 students who took Environmental Science and Disaster Mitigation courses, especially on environmental management materials. Furthermore, limited trial II was carried out on 38 students.

Observation sheets are used to measure students' 4C skills. Observation sheets are used during learning, then at the end of the learning students are given a cognitive test to measure their knowledge related to environmental management materials. In addition to observation sheets and cognitive tests, students were given a questionnaire response to the use of modules in the aspects of content eligibility, design aspects, and pedagogical aspects. The module is ready to use if the validator's average assessment is valid and very valid. The instrument is in the form of a questionnaire with a likert scale of 1-4. The module validation decision-making criteria can be seen in Table 1.

The validation results are calculated using the average score formula, namely:

$$M = \frac{\sum fx}{N} \quad (1)$$

Information:

M = Average score

Fx = Score earned

N = Number of validation components

Table 1. Validity Category

Score Interval	Validity Category
$3.25 \leq x < 4$	Highly Valid
$2.5 \leq x < 3.24$	Valid

$1.75 \leq x < 2.4$	Less Valid
$1 \leq x < 1.74$	Invalid

Modification Sugiyono [11]

Observation sheets are compiled based on critical thinking, creative, collaboration, and communication skills. The criteria for student skills based on the observation sheet are presented in table 2.

Table 2. Student Skill Criteria Based on Observation Results

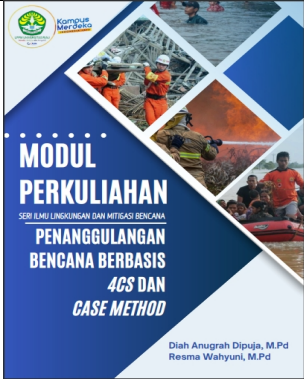
Interval	Predicate	Category
86 – 100	A	Highly Competent
81 – 85	B	Competent
76 – 80	C	Lack of competence
≤ 75	D	Incompetent

Retired Modification (2019)

3 **Result and Discussion**

The initial stage of module development is the analysis stage. The analysis stage was carried out by observing and interviewing several lecturers in environmental science and disaster mitigation courses. The results of the interview show that the use of modules based on case method has not been applied in learning, especially in disaster management materials. In addition, the results of observation and analysis of lecture teaching materials also found that the procurement of lecture modules that can improve students' 4Cs abilities is still limited, the method of case method has not been used thoroughly in learning so that the development of modules based on case method It is very important to do. The results of curriculum analysis and analysis of lecture materials show that Students are expected to possess problem-solving skills based on real-life problems. Various disaster cases that occur at the local and national levels require in-depth studies so that they can be handled properly. Disaster management requires critical and innovative ideas and ideas so that the formulation of solving problems related to the disaster that occurs can minimize risks and become an alternative solution. These activities can be carried out using modules based on case method.

Table 3. Module Development

Note	Display
Cover	 Module cover design design
Fill	A. Identitas Modul • Mata Kuliah : Ilmu Lingkungan dan Mitigasi Bencana • Alokasi Waktu : 4 x 90 Menit B. Tujuan Penggunaan Modul • Melalui kegiatan pembelajaran berbasis metode kasus yang dilaksanakan dengan bentuk debat kompetitif dapat melatih mahasiswa meningkatkan keterampilan berpikir kritis, komunikasi, kolaborasi, dan kreativitas serta pemecahan kasus secara efektif dan efisien pada topik bahasan penanggulangan bencana. C. Petunjuk Kerja Modul 1. Bacalah uraian materi yang ada pada setiap kegiatan belajar secara cermat. 2. Gunakan literatur sebagai tambahan informasi dari buku atau sumber lain yang relevan. 3. Kerjakan setiap kegiatan dalam modul sesuai jenis tugas mandiri atau kelompok. 4. Kegiatan kelompok dilakukan secara diskusi untuk penyelesaian kasus yang akan diangkat pada setiap kelompok. 5. Diakhir pembelajaran, kamu akan melakukan debat kasus yang sudah kamu diskusikan bersama kelompokmu serta presentasi poster kasus. III Module content design
Syntax of case method	PENYAJIAN KASUS Ikutilah instruksi berikut dengan benar! 1. Secara mandiri, carilah artikel atau hasil riset tentang bencana di Indonesia yang terbaru dan hangat dibicarakan, pilihlah satu isu yang terbaik! (4C: <i>Critical Thinking</i>) 2. Buatlah resume dari artikel/hasil riset tersebut tersebut meliputi : • Judul • Isi (Permasalahan, upaya pemecahan masalah, dan rumusan solusi permasalahan) • Daftar Literatur : sumber artikel/hasil riset* (minimal 3 sumber*) Resume IV Presentation of <i>case method</i> syntax

Note	Display
Syntax of case method and design of work Tentukanlah 1 kasus untuk kelompokmu, masing-masing kelompok diwajibkan membahas kasus yang berbeda. Diskusikan dengan teman kelompokmu terkait kasus yang terpilih lalu kembangkan kasus tersebut menjadi materi debat untuk kelompokmu. Cariilah referensi lainnya baik dari buku teks atau internet untuk sebagai tambahan data dan informasi agar gagasan dan materi debat yang dirancang semakin baik. (4Cs: <i>Critical Thinking, Collaboration</i>) PERANCANGAN KARYA Selanjutnya perhatikan ketentuan berikut ini: • Setelah mendiskusikan kasus/bencana secara berkelompok, rancanglah sebuah poster tentang kasus yang telah terpilih. • Poster berbentuk : □ Judul □ Isi (Masalah, Ide/gagasan pemecahan masalah, referensi) • Poster dikirimi ke grup "When-tp dengan forum : "Poster-Kelompok"-Penanggulangan-bencana" sesuai dengan deadline yang ditetapkan. • Poster yang memiliki kreativitas yang baik akan mendapat nilai lebih. (4Cs: <i>Creativity, Collaboration</i>)	PENDALAMAN MATERI A. Isu Lingkungan Lokal Di Indonesia, berbagai isu bencana lingkungan menjadi perhatian serius karena dampaknya yang merugikan terhadap kehidupan manusia, keberlangsungan ekosistem, dan perekonomian. Berikut adalah beberapa isu bencana lingkungan yang signifikan di Indonesia: 1. Banjir, merupakan peristiwa alamiah permukaan air yang meluap di daerah yang biasanya kering. Contoh kasus di Indonesia adalah banjir Jakarta pada tahun 2020. Pada bulan Februari 2020, curah hujan yang tinggi menyebabkan Sungai Ciliwung meluap dan menenggelamkan sebagian besar wilayah Jakarta. Banjir tersebut menyebabkan kerugian besar baik secara ekonomi maupun sosial, termasuk hilangnya nyawa, kerusakan infrastruktur, dan gangguan pada aktivitas masyarakat. 2. Abrasi, abrasi adalah proses pengerosan dan erosi pantai akibat gelombang laut, arus, dan angin. Contoh kasusnya adalah abrasi di Pantai Glagah, Yogyakarta. Pantai ini mengalami abrasi yang parah akibat gelombang besar dan aktivitas manusia yang merusak ekosistem pantai. Abrasi telah menyebabkan hilangnya lahan pertanian, rumah-rumah bergeser, dan terancamnya keberlangsungan hidup masyarakat pesisir yang bergantung pada pantai. 3. Kebakaran hutan dan lahan terjadi akibat faktor alami seperti cuaca kering dan faktor manusia seperti pembukaan lahan dengan cara membakar. Contoh kasusnya adalah Kebakaran Hutan dan Lahan Riau pada tahun 2019. Kebakaran yang meluas di provinsi Riau tersebut menyebabkan masyarakat yang tinggal, menimbulkan gangguan pada kesehatan masyarakat, dan kerugian ekonomi besar akibat penurunan produksi pertanian dan perikanan. 4. Degradasi hutan dan lahan gambut terjadi akibat aktivitas manusia seperti illegal logging dan konversi lahan untuk perkebunan atau pertanian. Contoh kasusnya adalah degradasi hutan dan lahan gambut di Kalimantan. Pembukaan lahan untuk perkebunan kelapa sawit dan pertanian menyebabkan degradasi hutan dan lahan gambut yang menjadi habitat bagi berbagai spesies unik. Degradasi ini juga meningkatkan risiko kebakaran hutan dan lahan.

Discussion Syntax

Problem-solving design and work design activities

KEGIATAN 2

PRESENTASI DAN DISKUSI KELAS

Pada kegiatan pembelajaran kali ini kamu akan melakukan presentasi debat kasus, sebelum memulai perhatikan ketentuan berikut ini :

- Presentasi debat kasus dilakukan selama 90 menit dengan ketentuan :
 - Masing-masing kelompok diberikan 15 menit (6 kelompok x 15 menit = 90 menit)
 - 5 menit pertama untuk kelompok penyaji
 - 5 menit kedua untuk kelompok wajib
 - 5 menit terakhir untuk kelompok lainnya.
- Presentasi kelompok dilakukan secara acak.
- Bagi kelompok yang belum terpilih, amatilah presentasi yang dilakukan kelompok yang maju dan berikanlah tanggapan berupa pertanyaan atau komentar dan akan ditanggapi oleh yang maju.
- Bagi kelompok yang maju, catatlah tanggapan dari kelompok lain pada kolom dibawah ini untuk ditanggapi
- Aspek konten debat, tanggapan, poster, serta keaktifan kelompok maupun individu akan dinilai.

(4Cs: *Communication, Critical Thinking, Collaboration*)



Classroom discussion activities

Competency Test

Uji Kompetensi

1. Strategi utama dalam penanggulangan bencana alam di Indonesia....
 - a. Evakuasi massal
 - b. Pemberdayaan masyarakat lokal
 - c. Pembangunan tanggul dan bendungan
 - d. Pemindahan penduduk ke wilayah yang lebih aman
 - e. Penyediaan fasilitas darurat
2. Metode yang paling efektif untuk mengurangi kerentanan terhadap bencana alam di Indonesia adalah dengan
 - a. Mengubah pola hidup masyarakat
 - b. Memperkuat infrastruktur yang sudah ada
 - c. Membangun lebih banyak shelter darurat
 - d. Menyebarkan informasi tentang bencana melalui media social
 - e. Meningkatkan kapasitas respon darurat pemerintah
3. Pendekatan yang dianggap paling berkelanjutan dalam mengurangi risiko bencana alam adalah dengan....
 - a. Meningkatkan pengawasan dan penegakan hukum
 - b. Melakukan simulasi bencana secara berkala
 - c. Meningkatkan kerjasama internasional dalam mitigasi bencana
 - d. Memperkenalkan teknologi canggih untuk deteksi dini
 - e. Mengedukasi masyarakat tentang tata kelola lingkungan yang berkelanjutan
4. Manajemen bencana yang efektif melibatkan koordinasi pada pihak....
 - a. Pemerintah pusat dan pemerintah daerah saja
 - b. Pemerintah, lembaga swadaya masyarakat, dan sektor swasta
 - c. Lembaga internasional dan pemerintah pusat
 - d. Militer dan badan penanggulangan bencana
 - e. LSM lokal dan masyarakat setempat

The subsequent phase is the design stage, which involves creating a module design based on the case method. The designed module contains aspects of module format and graphics, content aspects and language aspects. These three aspects are then used as a reference for module development. Furthermore, at the development stage, modules are developed according to development references. The modules developed are validated by experts or validators, namely media experts and material experts. Case method-based module validation is carried out to assess the validity, practicality, and effectiveness of the module products developed. Some suggestions for improvement from experts such as the use of images, ineffective sentence writing, the use of too small spaces and improvements to the bibliography. The results of the validation of the case method-based module can be seen in table 4.

Table 4. Module Validation Results

Aspects	Average	Category
Module Format and Graphics Aspects	3,5	Highly Valid
Content Aspects	3,5	Highly Valid
Language Aspects	3,67	Highly Valid
Average	3,56	Highly Valid

The results of the module validity test show that the module developed has very good quality. The format and graphic aspects obtained a validity value of 3.5, which indicates that the design and appearance of the module are in accordance with expected standards, supporting easy access and understanding of the material. The content aspect also received a validity value of 3.5, indicating that the material presented is relevant, accurate and in line with the learning objectives that have been set. The language aspect obtained a validity value of 3.67, which shows that the use of language in the module is clear and easy to comprehend. is clear, easy to understand, and effective in conveying information to students. Overall, the average module validity was obtained at 3.56, this falls within the "very valid" category, indicating that the developed module is of high quality and well-suited for implementation in the learning process.

Table 5. Module Practicality Questionnaire Results

Aspects	Average	Category
Eligibility Aspects of Content	83,68	Highly Practice
Planning Aspects	86,03	Highly Practice
Pedagogic Aspects	85,53	Highly Practice
Average	85,08	Highly Practice

The practicality test results indicate that the developed teaching module is highly appropriate for use in the learning process. The content feasibility aspect obtained a practicality value of 83.68, which shows that the material in the module can be applied

easily and effectively in the learning context. The planning aspect received a practicality score of 86.03, indicating that the learning planning contained in the module has been prepared very well and is ready to be implemented. Apart from that, the pedagogical aspect received a practicality score of 85.53, which shows that the pedagogical approach used in the module supports interactive learning methods and is appropriate to student needs. With an average practicality value for the teaching module of 85.08, which is included in the very practical category, this module has proven to be effective and ready to be used in the learning process.

Table 6. Results of Observation of Students' 4Cs Skills

Skills 4Cs	Class A	Category	Class B	Category
Think	87,11	Highly	83,42	Competent
Critical		Competent		
Communication	86,58	Highly	84,08	Competent
		Competent		
Collaboration	86,32	Highly	82,76	Competent
		Competent		
Creative	86,71	Highly	83,82	Competent
		Competent		
Average	86,68	Highly	83,52	Competent
		Competent		

The results of observations of students' critical thinking, communication, collaboration and creative skills showed that both classes showed very good achievements. Class A obtained an average score of 86.68, which is in the very competent category, indicating that students in this class have succeeded in developing 4C skills at a high level of ability. Meanwhile, class B obtained an average score of 83.52, which is included in the competent category, indicating that although the 4C skills of students in this class are good, there is still room for further development. Overall, both classes demonstrated positive progress in mastering the 4C skills, which are key to their readiness to face challenges in the professional world and society.

4 Conclusion

The research findings lead to the conclusion that the case method-based module on disaster management content is valid, practical, and can improve students' 4C skills. Further research is expected to develop a case method-based module on other materials.

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