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THE PROTOTYPE OF 4CS-BASED BLENDED LEARNING CONTENT

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ABSTRACT

This research intended to produce a valid and practical 4Cs-based blended learning content prototype for higher education. This study employed a research and development (R&D) model with a subject validity trial by experts and a practicality trial by lecturers and students of informatics in a computer engineering education program. The trial data were collected through a questionnaire developed from the 4Cs of communication, collaboration, critical thinking, creativity, as well as observations that were then analyzed using descriptive statistics. The validity results of blended learning content for all 4Cs indicators, especially the collaboration indicator, were in the very valid categories. The practicality results of blended learning content for all indicators of 4Cs were in the very practical category, especially the critical thinking indicator from the lecturers and the communication indicator from students. The total results of practicality from lecturers and students showed that a communication indicator was in the very practical category and the highest when compared to the other three indicators. Separated from lecturers and students, the collaboration indicator was in the very practical category, but it was the lowest compared to the other three indicators. Although the results of evaluating the blended learning content for each indicator of 4Cs tended to be different, all indicators met validity and practicality. The results of this research have significant implications for the development of content, the presentation of sources, and the use of blended learning activities to meet the demand to develop 21st century skills as demonstrated by 4Cs.

Keywords: blended learning content, 4Cs, 21st century skills

INTRODUCTION

The 21st century demands that lecturers prepare students to face an increasingly globalized world. This demand creates the need for lecturers to equip students with a holistic education that emphasizes life skills such as communication, cross-cultural collaboration, and critical thinking (Teo, 2019). These skills are essential for graduates of higher education programs to maintain and develop their intellectual and creative potential (Matukhin & Zhitkova, 2015). Thus, implementing education

in Indonesia should not be limited by being in the public space and having limited time allocated to it; it should find ways and methods to overcome these restrictions (Kofar, 2016).

Information and Communication Technology (ICT) is a solution for today's teaching and learning challenges, and it is an integral part of the education system and tends to dominate the teaching and learning process in modern universities (Buran & Evseeva, 2015). E-learning is one form of ICT-based learning that is being applied today, and it has

become a popular approach to effective learning in the wider academic community (Alsalmi et al., 2019). E-learning is a direct and dynamic learning environment that uses the internet to improve the quality of learning by providing resource access, information services, and remote collaboration (Mahande & Jasruddin, 2018).

The significant advantage of e-learning is that it supports students because it has special capacities such as interactivity, information source searching, physical mobility and placement of educational activities, independent learning, personal learning and training, and active learning techniques and gaining knowledge (Mohammadi, 2015). However, e-learning has not yet been able to address all the needs of students in the educational process, especially their psychomotor and affective needs. Therefore, integrating face-to-face teaching methods with e-learning, known as blended/hybrid learning, is the best solution (Hubackova & Semradova, 2016). Blended learning becomes an effective model for higher education (Buran & Evseeva, 2015) in courses that contain more visual elements (Alsalmi et al., 2019). The implementation of blended learning in higher education is increasing because it offers students flexibility in terms of when and where they can learn, and it can offer diverse material and varied student content (Boelens et al., 2018).

Blended learning combines the elements of face-to-face teaching, such as independent learning, communication, and collaboration, with social interaction that allows more variation and flexibility than just face-to-face education. Online teaching combined with face-to-face teaching can stimulate learning and provide more collaborative learning experiences (Okaz, 2015). The main objective of blended learning is to enrich and enhance student learning experiences by combining the best features of classroom teaching with the best features of online learning, and promoting active self-learning that reduces the time spent in class (Doering, 2006; Mossavar-Rahmani & Larson-Daugherty, 2007). From this perspective, it is important for universities to integrate their content into online lessons (Buran & Evseeva, 2015), so that learning materials can be added or withdrawn to complement and enhance the learning experience in the classroom (Mossavar-Rahmani & Larson-Daugherty, 2007)

Based on research observation, this study focused on lecture materials used in discussion, student assignments, and their evaluations. Although the teaching and learning process was facilitated online, it would not be considered blended learning. More specifically, the blended learning presentation content had not been fully integrated with the skills of communication, collaboration, critical thinking, and creativity (known as the 4Cs). These skills are important for students in higher education and had been integrated into the semester learning plan (syllabus), but they had not been integrated into the presentation of learning source content and the learning activities.

Using face-to-face teachings methods was the main choice because these methods could accommodate three essential aspects of learning, namely, knowledge, skills, and attitudes. One drawback was that learning that focused on the face-to-face method would be passive because it prevented students from critically filtering the information conveyed by the instructor. Concentrating only on face-to-face interactions does not provide space for collaborative learning, nor does it allow lecturers to apply high-level thinking skills (Okaz, 2015). The results of limited interviews with students conducted by researchers also provided information that face-to-face classes tended to be boring, which had an impact on decreasing learning motivation. As a result, students were present in class, but their participation in the learning process was weak.

The rapid growth of technology has changed the behavior and attitudes of students, their way of learning, and their communication inside and outside the classroom. Smartphones, tablets, and online game applications have reduced the attention span of students and distracted them from retaining information (Okaz, 2015). Therefore, this was why it was import to restructure the learning process as a blended learning one. What was most important for developing the content of blended learning materials was to accommodate the changes in today's students in terms of their thinking, studying, communication, and collaboration habits.

The results of previous studies have shown that blended learning increases the chances of students to achieve course results by reducing dropout rates and increasing test scores, student motivation (Kaur, 2013; Sjukur, 2012), student learning

outcomes (Sjukur, 2012), and student achievements (Alsalhi et al., 2019). Furthermore, the results of other studies have shown that lecturers/instructors have a positive attitude towards integrating online learning into face-to-face teaching (Kofar, 2016), which indicates that blended learning could increase students' learning motivation and learning outcomes. Besides that, lecturers responded positively to a blended learning model, which means that blended learning has excellent potential for regulating different teaching styles in higher education (Buran & Evseeva, 2015). Explicitly, the results of previous studies confirmed that blended learning is not only beneficial for student communication skills, but it is also essential for life after school and being in the working world (Sriarunasmee et al., 2015). Blended learning can improve the quality of learning collaboration (Ellis et al., 2016), and it has a positive effect on cognitive perception, namely, the ability of students to construct meaning from discussion and reflection (Law et al., 2019). However, this study focused only on media use, teaching material management, and activities for one subject. The development and implementation of blended content use was unexplained even though the previous description confirmed that content development in the age of information, media, and technology was very important to provide learning experiences for students to develop the skills needed to meet the demands of the 21st century.

Blended learning content needs to be developed in lecture material that addresses student characteristics and develops 21st century skills. According to Trilling & Fadel (2009), 21st century skills consist of the 4Cs, namely critical thinking, collaboration, communication, and creativity. The research question for this study was: How can we develop and produce blended learning content that meet the 4Cs criteria?

This research aimed to develop and produce a valid and practical prototype of blended learning content based on the 4Cs. Therefore, we developed indicators or criteria of the 4Cs as content prototype that are then integrated and presented in blended subjects. Furthermore, this research is fundamental to producing scientific information related to content criteria that is worth adding to blended learning. The results of this study contribute to providing design guidelines for the development

and presentation of learning resource content and blended learning activities in higher education that are integrated with the 4Cs. If this criterion is explored and integrated well with blended learning content, it will produce students who have developed the skills of the 4Cs.

LITERATURE REVIEW

Blended/Hybrid learning

Blended learning is considered the most effective and the most popular teaching model to be adopted by higher education because it is felt to be effective in providing flexible, timely, and sustainable learning (Rasheed et al., 2020). The idea of combining instructional materials with online intervention has been proven to be an improvement over the traditional face-to-face mode and fully online mode of instruction (Rasheed et al., 2020; Vanslambrouck et al., 2018).

Blended learning is a combination of in person lectures with various forms of online and offline technology presented through learning strategies that integrate multiple synchronous and asynchronous communication modalities to achieve an optimal quality of learning processes (Kaur, 2013; Kulvietiene & Sileikiene, 2006). Blended learning has a number of advantages compared to face-to-face learning, namely: (1) being flexible and appropriate for the characteristics of student learning styles; (2) developing creative and critical thinking so that students become active; and (3) reducing the workload of lecturers so they have more time to work on other materials (Buran & Evseeva, 2015); (4) providing active learning that forces students to read, speak, listen, and think; and (5) providing relevant and interactive content (Buran and Evseeva, 2015; Kaur, 2013).

However, blended learning also has weaknesses. ³ Most online courses are designed in the same way as face-to-face lectures, and they have the same content/material, an equal number of credit hours, and they are led by the same lecturers who interact with students directly. It takes a lot of effort by lecturers to design online courses and to teach online, so it is preferable that the course be designed by a technology team and professional lecturers (Buran & Evseeva, 2015). The content of a blended course must be developed to create a learning experience that addresses the demands of the 21st century, which means in light of the 4Cs skills.

4Cs Skills

5 The Partnership for 21st Century Skills presents the 4Cs as communication, collaboration, critical thinking, and creativity, and they are fundamental and essential skills for success in a career and life outside of educational institutions. The 4Cs help students to develop and demonstrate a good understanding of information, media, and technology (Kivunja, 2015).

Communication: This is the ability to compile, understand, and communicate ideas to others through oral or written language (Pheeraphan, 2013). Furthermore, communication skills are the ability to express and transfer knowledge through written, ICT, and verbal presentations (Sriarunrasmee et al., 2015). Effective communication has always been an essential skill for success in education, family relationships, and all walks of life. The progress of digital media and technology makes the need for effective and clear communication to be more vital than in previous generations. Communication skills can be practiced in the form of synchronous and asynchronous digital communication.

Collaboration: This is the ability to work effectively with others and to appreciate and be responsible for group work (Pheeraphan, 2013). Collaboration is essential for teamwork, group work, and collaboration. In pedagogical practice, the three elements of collaboration at first glance look to be the same, but they are not identical.

Critical Thinking: This is a complex process that demands high-level reasoning to achieve a desired result (Wechsler et al., 2018). Critical thinking consists of the rational mental processes of analyzing and evaluating (Akyüz & Samsa, 2009). The mental model will influence the nature and success of creative problem solving (Wechsler et al., 2018). More broadly, critical thinking involves inquiring about the source of knowledge, testing the validity of information obtained, analyzing its reliability, and describing an explanation that is appropriate for a particular task or situation (Wechsler et al., 2018). 7 Critical thinking refers to an individual's ability to use the cognitive processing skills that are included in Bloom's higher order thinking (HOT), which is analyzing, evaluating, and building on or creating new ideas. Critical thinking is thinking deeply and solving unknown problems in different ways. 14 This is an important skill because the 21st

century is characterized by digital technology and fast-changing information, so students must have the capacity to think, manage, and respond to information and problems rationally.

Creativity: This is the process by which an individual produces an original product that is culturally and contextually valuable in a particular domain and plays an essential role in society (Yeh et al., 2011). Being creative applies not only to producing products but in thinking as well. The ability to think creatively grows from one's creativity (Wahyudi et al., 2018) and involves cognitive processes, personality characteristics, and environmental variables, as well as the interaction of these components (Wechsler et al., 2018). Creativity is the primary driver of progress in various global endeavours.

These skills will not be easily achieved solely in the conventional face-to-face learning process or solely in online learning process; both modes must be combined into blended learning. Blended learning can accommodate learning based on the 4Cs because they require 12 direct (face-to-face) synchronous learning indirect (online) asynchronous learning. Learning the 4Cs is dependent on the content of the source/teaching material and the activities carried out online and face-to-face. Therefore, we developed blended learning content for this study that started with preparing semester learning plans, material mapping, learning strategies, teaching materials, and digital activities according to 4Cs indicators or the criteria determined in this study.

METHODOLOGY

Type of Research and Development Procedure

This research was aimed at developing 4Cs blended learning content and employed educational research and development (R&D), which is a process used to improve and validate educational products (Borg & Gall, 1983). Therefore, to produce valid and practical blended learning content, the appropriate development model for this research is the R&D model (Trollip & Alessi, 2001). This model 6 consists of three stages, namely (1) planning, (2) design, and (3) development, and was chosen because it contained needs-based and systematic procedures, especially in testing the results of development. Figure 1 below is the procedure for developing the 4Cs blended learning content.

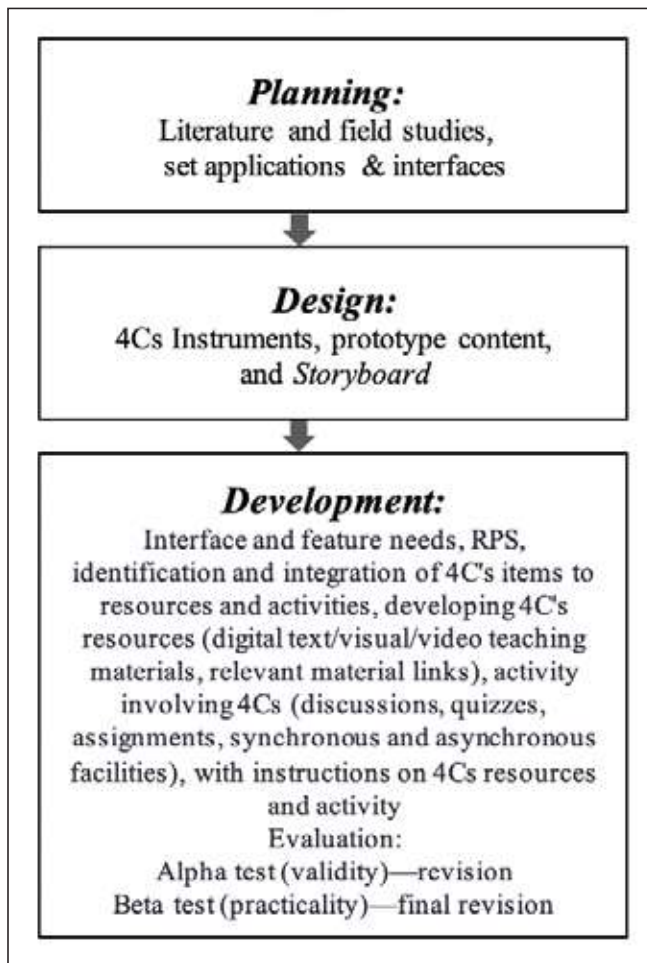


Figure 1. The Development Procedure of 4Cs Blended Learning Content (Adapted from Trollip & Alessi, 2001)

Location and Subject of Product Trial

This research was conducted in the Department of Informatics and Computer Engineering Education, Engineering Faculty, Universitas Negeri Makassar, Indonesia. The subjects of this research were experts, lecturers, and students, and they were purposively selected. This research used an alpha test to produce product validity using four experts and a beta test to create product practicality using five lecturers and 34 students.

The Technique of Data Collection

The method of data collection was through a questionnaire and observation. The survey was used to obtain quantitative data that aimed to reveal the responses of experts, lecturers, and students regarding the results of developing 4Cs blended learning content. The questionnaire was based on 4C competencies (Kivunja, 2015; Trilling & Fadel, 2009) and used a 1–4 scale

assessment (Very invalid/very not good = 1, Invalid/not good = 2, Valid/good = 3, Very valid/very good = 4). The lecturers and students were observed as they accessed the site and the blended learning content developed.

11 Validity and Reliability of the Instrument

The validity of the instrument content and product involved four experts from various fields of expertise related to this research, namely: (1) e-learning, (2) multimedia learning and vocational education, (3) cognitive education, and (4) context-aware learning and recommender systems. The results of the four experts' assessments were analyzed using the Aiken's formula ($V > 0.92$, Sig. 0.05). Meanwhile, reliability tests used Cronbach alpha coefficient formula ≥ 0.7 (Hair et al., 2006).

15 Data Analysis

The data were analyzed using descriptive analysis. The descriptive analysis presented percentages, tables, and images of expert, lecturer, and student assessment results at the product evaluation stage of blended learning content. The researchers operated IBM SPSS 20 Version for data analysis.

RESULTS

Planning

This stage included two main activities, a literature study and a field study. The literature study examined theories relevant to the study and reviewed the research findings through reading books and journal articles. The field study was conducted by observing the conditions of the campus facilities and the blended course contents that would be developed directly for the study. The students were observed and the lecturer team gave an introduction to vocational education and multimedia learning. The observations were related to the resources and learning activities that were needed. From these results, a profile of blended learning content implementation was obtained, especially as related to activities or content objects that were developed according to the characteristics of the students and 4Cs skills. Moodle Learning Management System (LMS) was chosen in consideration of its features that supported the 4Cs and the LMS with which the lecturers and students were familiar.

Design

In this stage we developed the initial concept resulting from the previous planning. The results of this design stage were 4C item indicator formats (instrument forms) that were ready to be validated. The instrument validation stage was carried out by four experts in the scientific fields that were relevant to the research topic: (1) e-learning, (2) multimedia learning and vocational education, (3) cognitive education, and (4) context-aware learning-recommender system. The instrument validation results of the four experts with Aiken's criteria ($V > 0.92$, Sig. 0.05) showed a communication indicator with seven items (all valid), a collaboration indicator with seven items (five valid and two invalid), a critical thinking indicator with 10 items (eight valid and two invalid), and a creativity indicator with 10 items (six valid and four invalid). Invalid items could not be used as references for the development and testing of 4Cs blended learning content in this research. In addition to the instruments, this stage presented the initial design of blended learning content in the form of initial prototypes and storyboards content with the LMS feature (see Figure 2).

Development

The design of 4Cs blended learning went through several stages:

1. designing the appearance and analyzing the LMS features according to the needs and characteristics of the material content,
2. preparing the semester learning plans (RPS),
3. identifying validated 4Cs content items to integrate them into the resources and learning activities,
4. developing 4Cs item-based blended learning content, such as material, modules, or digital teaching materials (text/visual /video), material enrichment links and learning activities content (discussions, quizzes, evaluations, asynchronous and synchronous facilities), and
5. making blended content mapping to present descriptions, forms and lectures methods, time, teaching materials and face-to-face and online activities.

The final result of this last stage was an alpha test on experts to obtain product validity and beta tests of lecturers and students to obtain validity

Course name (+course code +credit semester)	
Study program/department:	
Semester (+year):	
Greetings text and can be an image:	
Lecturer Profile: Photos Name e-mail/Web Mobile/WA No.	
Course description (page or label feature)	semester learning plan reference (syllabus)
Learning outcomes (page or label feature)	
How to learn (page or label feature)	
How to grade/rate (page or label feature)	
Program map/sequence of teaching materials & time load (page or label feature)	
Reference (book or label feature)	
Topic/Weekly (f2f or online session)	
Course description for the week	Initial activity
Apperception-discussion /brainstorming (feature forum)	
Teaching materials/resources in the form of text, visual, video formats (book, file, page, label, URL features)	Core activities
Exercise/Quiz (assignment or quiz feature)	
Discussion/communication Forum (Chat, Forum or vicon-bigbluebutton or jitsi feature)	
Assignment or exams-individuals & groups (quiz or assignment feature)	Close activities
Feedback (forum or survey feature)	
Reflection (forum or survey feature)	
Topic/Weekly etc.	

Figure 2. The Storyboard for 4Cs Blended Learning Course Content Development

until the final revision. In this research, the tests were limited to the formative tests (alpha and beta tests) and did not cover the summative test. The purpose of research was to produce content that was valid and practical but not to test the effectiveness of the content. So, with a formative test, the use of the research could be realized or answered. The alpha test and beta test results are described in Tables 1–4.

Alpha Test (Validity) and Beta Test (Practicality)

The alpha and beta tests were part of the development stage. The results of item analysis in Table 1 (below) were assessed by experts for validity using an alpha test and assessed by lecturers and students for practicality using a beta test. The results of the practicality test were the results after revising during the validity stage.

Table 1 shows that the results of the validity tests conducted by experts were in the very valid criteria. The practicality test results carried out by lecturers and students were also in the very practical or good category. In general, the responses of experts, lecturers, and students were very high because blended learning content provided feedback and written and virtual communication facilities to listen and exchange ideas, knowledge, and learning activities (items 1, 2, and 4).

Table 1. The Analysis of Communication-based Blended Learning Content

No	Item assessed	Mean (X)		
		Experts (n=4)	Lecturers (n=5)	Students (n=34)
1	Blended learning content provides email, chat, and forum facilities to communicate in writing to exchange ideas, knowledge, and learning activities.	4.00	3.80	3.59
2	Blended learning content offers video conferencing to communicate virtually, listen, and exchange ideas, knowledge, and learning activities.	4.00	3.80	3.47
3	The individual task is to make a video of the blended learning presentation in an effort to evaluate how to convey ideas.	3.75	2.80	3.26
4	The blended learning content provides feedback that consists of critique and suggestions.	4.00	4.00	3.44
5	The contents of the blended learning material is a video (learning, case, or project) to watch and responded to.	3.75	3.40	3.56
6	In general, the contents of the blended learning material present effective and clear written and oral communications.	3.75	3.00	3.44
7	In general, the content of the blended learning material presents data/information with clear instructions/directions.	3.75	3.60	3.59
	Mean total	3.86	3.49	3.48
	Percentage	96.4%	87.1%	87.0%

Note: $X < 2.00$ = Very invalid/very not good; $2.50 > X \geq 2.00$ = Invalid/not good; $3.00 > X \geq 2.50$ = Valid/good; $X \geq 3.00$ = Very valid/very good; 0%–20% = Very weak; 21%–40% = Weak; 42%–60% = enough; 61%–80% = Strong 81%–100% = Very strong

Table 2. The Analysis of Collaboration-based Blended Learning Content

No	Item assessed	Mean (X)		
		Experts (n=4)	Lecturers (n=5)	Students (n=34)
1	Blended learning content provides chat and forum facilities (asynchronous facilities) for brainstorming.	4.00	3.80	3.47
2	Blended learning content provides video conference (virtual synchronous) facilities for brainstorming.	4.00	3.80	3.47
3	Group assignments to review/resume book with clear instructions/directions.	4.00	3.00	3.24
4	Group paper assignments with clear guidelines and instructions/directions.	4.00	3.40	3.38
5	Cooperative model of group assignments through think-pair-share (thinking, responding, collaborating) to study new topics and to discover new knowledge.	3.75	3.20	3.35
	Mean total	3.95	3.44	3.38
	Percentage	98.8%	86.0%	84.6%

Note: $X < 2.00$ = Very invalid/very not good; $2.50 > X \geq 2.00$ = Invalid/not good; $3.00 > X \geq 2.50$ = Valid/good; $X \geq 3.00$ = Very valid/very good; 0%–20% = Very weak; 21%–40% = Weak; 42%–60% = enough; 61%–80% = Strong 81%–100% = Very strong

Table 2 shows that the results of the validity tests conducted by experts were in the very valid criteria. The practicality test results carried out by lecturers and students were also in the very practical or good category. In general, the response of experts, lecturers, and students about blended learning content was very high, especially in terms of the availability of chat, forum (asynchronous),

and video conference (synchronous) facilities for brainstorming (Items 1 and 2).

Table 3 shows that the results of the validity tests conducted by experts were in the very valid criteria. The practicality test results carried out by lecturers and students were also in the very practical or good category. In general, the responses of experts, lecturers, and students about blended

Table 3. The Analysis of Critical-thinking-based Blended Learning Content

No	Item Assessed	Mean (X)		
		Experts (n=4)	Lecturers (n=5)	Students (n=34)
1	The content of blended learning material is relevant to the topic/material of study at each meeting session.	3.50	3.40	3.47
2	The content of blended learning material is presented in text format (article links, a piece of writing/reading, ebook, and own learning instructions).	3.75	3.20	3.32
3	The content of blended learning material is presented in a visual format (presentation slides, pictures /models/graphs).	4.00	3.60	3.47
4	The content of blended learning material is presented in video format (a video recording or video link that is relevant to the topic).	3.75	3.60	3.35
5	Other learning resources (internet URL links) are provided to enrich the content of blended learning material.	3.75	3.60	3.47
6	Blended learning content provides a forum for debate with clear instructions/directions.	3.75	3.80	3.35
7	Project-based individual and group assignments with clear direction (e.g., applying what is learned to solve problems).	3.75	3.60	3.29
8	In general, the blended learning content presentation provides an opportunity to analyze, assess, and reconstruct to find new things or new solutions.	4.00	3.40	3.35
	Mean total	3.78	3.53	3.39
	Percentage	94.5%	88.1%	84.7%

Note: $X < 2.00$ = Very invalid/very not good; $2.50 > X \geq 2.00$ = Invalid/not good; $3.00 > X \geq 2.50$ = Valid/good; $X \geq 3.00$ = Very valid/very good; 0%–20% = Very weak; 21%–40% = Weak; 42%–60% = enough; 61%–80% = Strong 81%–100% = Very strong

Table 4. The Analysis of Creativity-based Blended Learning Content

No	Item Assessed	Mean (X)		
		Experts (n=4)	Lecturers (n=5)	Students (n=34)
1	The blended learning content presents material links/links to be explored to obtain new knowledge.	4.00	3.40	3.41
2	Individual assignments create unique digital material content (multimedia).	3.75	3.40	3.44
3	The individual task is to make learning material from various reliable sources that is completed by presentation slides according to the instructions/ directions given.	3.75	3.60	3.38
4	Choosing one of the themes from the specified themes as individual project assignments.	3.75	3.40	3.38
5	Individual assignments and group activities are demonstrated in video format.	3.75	3.40	3.32
6	In general, the contents of the blended learning material presentation provide an opportunity to explore and investigate new knowledge.	3.75	3.80	3.35
	Mean total	3.79	3.50	3.38
	Percentage	94.8%	87.5%	84.6%

Note: $X < 2.00$ = Very invalid/very not good; $2.50 > X \geq 2.00$ = Invalid/not good; $3.00 > X \geq 2.50$ = Valid/good; $X \geq 3.00$ = Very valid/very good; 0%–20% = Very weak; 21%–40% = Weak; 42%–60% = Enough; 61%–80% = Strong; 81%–100% = Very strong

learning content were very high, because blended learning content presented visual formats and forums for debate with clear instructions (items 3 and 6).

Table 4 shows that the results of the validity tests conducted by experts were in the very valid

criteria. The practicality test results carried out by lecturers and students were also in the very practical or good category. In general, the responses of experts, lecturers, and students about blended learning content were very high, because the presentations of material and content link could be

explored to investigate and provide new knowledge (items 1 and 6).

A general description of the expert, lecturer, and student assessment percentage results on 4Cs contents and visual indicators are presented in graphical form in Figure 3.

Figure 3 shows that, in general, the results of the validity test for 4Cs-based blended learning content, especially the collaboration indicator, were in the very high/very good category. The results of the practicality of blended learning content conducted by lecturers and students also showed a very high/very good criteria, especially on the critical thinking indicator from the lecturer side and the communication indicator from the student side. In total, the lecturer and student communication indicators showed very high values compared to the other three indicators. However, separated from the lecturer and student, the collaboration indicator showed a value lower than the other three indicators.

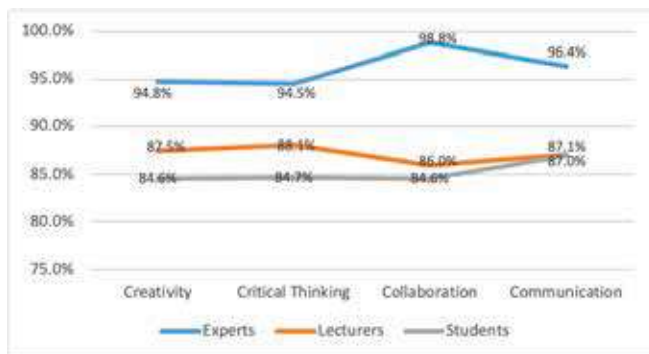


Figure 3. The Result of 4Cs Blended Learning Content Evaluation

DISCUSSION

The success of blended learning was supported by adaptive and interactive content that could stimulate and improve 4Cs capabilities. Blended learning content was designed before the learning was carried out, and it started with the appearance, content structure, learning resource formats, and learning activities that could be carried out face-to-face and online through either synchronous or asynchronous facilities. In the development and implementation of the content, the presentation and delivery of it should be adapted to the chosen blended learning model (Horn & Staker, 2014).

Determining the model was important because it made it easier for lecturers to identify any learning resources and learning activities, as well as

strategies and methods, that were suitable for face-to-face and/or online learning.

Before discussing the results in detail, it should be emphasized that the purpose of this research was to produce a valid and practical prototype of 4Cs blended learning content. This blended learning content offered learning resources and learning activities that could create learning experiences related to communication skills, collaboration, critical thinking, and creativity. To produce this learning experience, the integration of 4Cs skills into blended learning content needed to be correctly identified and developed.

Communication: Blended learning content needs to offer communication space in the classroom through a question and answer format and by delivering ideas through presentations, discussions, and virtual communication via video conferencing (vcon) and written communication such as email, chat applications, and discussion forums. This is important because communication is the ability to organize, understand, and communicate ideas to others through oral and written language so that they can be readily understood by others (Trilling & Fadel, 2009; Pheeraphan, 2013; Kivunja, 2015). Communication skills are used to convey ideas, knowledge, attitudes, and experiences among individuals and groups through speaking, writing, gestures, and symbols (Sriarunrasmee et al., 2015). Therefore, face-to-face and online learning is needed to provide communication and feedback opportunities and to facilitate listening and sharing ideas, knowledge, and learning activities among students and lecturers. Related to this idea, Sriarunrasmee et al. (2015) also stated that giving feedback, providing more time to chat online, posting, and publishing learning information are very important information literacy efforts for lifelong learning. Furthermore, feedback from peers, facilitators/tutors, and lecturers while practicing skills during face-to-face and online learning can help students eliminate anxiety and increase their independence in communication (Shorey et al., 2018), especially with online video access that explains the basics of communication skills with examples from authentic situations (Shorey et al., 2018). However, only a few received advice and critique about the learning process. Thus, the presentation of data and information, through both teaching materials and learning

activities, should have clear meanings, ethics, and instructions.

Collaboration: Brainstorming was very important, because the blended learning content was able to facilitate both face-to-face and online learning with both synchronous collaboration (video conference) and asynchronous collaboration (email and forums). Asynchronous and synchronous activities increased collaboration and interaction between students and instructors/lecturers when run in a balanced manner (Qiu, 2019). This facility is important for promoting student synchronous and asynchronous collaboration to make various edits, write comments, and perform other important options to facilitate learning. This facility has provided a substantial increase in student collaboration through actively discussing, sharing, and editing learning resources (Al-Samarraie & Saeed, 2018). The collaboration facility was also important because students tended to form closely knit groups and collaborate in larger groups but work less on their own. Also, online learning requires a lot of design and lecture time, especially to provide the understanding and create learning experiences through well design assignments every week (Ellis et al., 2016). Group assignments, as part of learning activities, needed to be delivered in the form of a book review or book resume and written on paper. The assignment feedback could be sent online through assignment facilities or presented and discussed face-to-face in class, or vice versa. The blended learning content also works well with the cooperative model of think-pair-share, which trains students to think, respond, cooperate, and demonstrate in their effort to study new topics to find new knowledge (Kivunja, 2015; Trilling & Fadel, 2009). In connection with this, the content should be accompanied by clear instructions and current and relevant topics sources.

Critical Thinking: The blended learning content presented visual formats in the form of lecturer's presentation slides, drawings, models, or graphics that were relevant to the topic or subachievements of learning. Blended content also needs to provide content that is formatted with learning videos, links to relevant material (Kivunja, 2015), and writing or reading material or ebooks. This form of content was used so that the presentation could reconstruct knowledge and find new problems and solutions. Oral and

written argumentation, reading, analyzing, and synthesizing through written, graphic, and audio-visual content are considered the most effective way to teach critical thinking skills (Bezanilla et al., 2019). The results of this study show that forums for debate that are arranged and directed by lecturers are the core of this skill because to improving critical thinking skills, more discussion forums are needed, whether they are synchronous and asynchronous forums (Akyüz & Samsa, 2009) or face-to-face and online forums. It is best if the discussion forum has an argument debate, because Kivunja (2015) stated that activities to improve critical thinking skills require debate on current controversial issues in the campus or community environment with arguments that can defend a position or attitude on the problem. For individual and group work, project and problem-based assignments, case studies, and discovery-based assignments are suitable for supporting critical thinking skills in blended learning (Bezanilla et al., 2019; Kivunja, 2015; Trilling & Fadel, 2009). Even project-based learning is one of the most effective methodologies for learning critical thinking skills (Bezanilla et al., 2019). Problem-based learning is good for thinking fast and discussing, evaluating, and solving problems, as well as describing solutions (Haghparast et al., 2014). More specifically, a problem solving ability is the ability to think critically, so lecturers should care about how to develop learning in classrooms to develop students' abilities to solve problems (Wechsler et al., 2018) and link this with the real world as a form of effective teaching and learning (Bezanilla et al., 2019). In its implementation, task instructions and task completion guidance could be done face-to-face, while guidance on assignment and assigning tasks could be done online.

Creativity: Blended learning content should provide links to material to be explored by students in an effort for them to gain new knowledge. Apart from the lecturer presenting content, it could also be done through individual assignments. Materials or assignments can be made according to guidelines and instructions from various reliable sources and supplemented by presentation slides. This would foster student creativity in screening various sources and creating a unique presentation with multimedia slides. Creativity will arise if students are given the opportunity, especially if they see

examples first, because students tend to imitate the teacher to come up with ideas about creative work (Wahyudi et al., 2018). Individual project assignments were also given by presenting several face-to-face or online themes and then asking students to choose the themes for their papers, which were then sent online and presented and discussed face-to-face. In research by Yeh, Huang, & Yeh (2011), students were asked to submit group assignments that allowed them to practice strategies for creativity instruction. Functional individual or group assignments were demonstrated in video format (Kivunja, 2015) or through the mind map to find out how the students were thinking, and then these shared and discussed online or face-to-face. Guided group discussion, peer assessment, and feedback are equally important to foster creativity (Yeh et al., 2011).

A prototype of a 4Cs-based blended learning content model is presented in Figure 4.

Figure 4 shows an empirical prototype of 4Cs blended learning content. This empirical prototype results from indicators or content criteria that met values above average (See Tables 1–4) as was emphasized in the research discussion. This blended learning content prototype includes indicators or criteria from 4Cs. The criteria of this prototype need to be explored and added in every presentation of teaching materials and learning activities in blended learning in the two

dimensions of place and time. Place is the face-to-face dimension and online dimension, while time is the synchronous dimension and asynchronous dimension (Heckman et al., 2015). Synchronous blended learning is defined as learning and teaching through synchronous technology media such as video/web conferencing or the virtual world (Yang et al., 2019), while asynchronous blended learning is learning and teaching through asynchronous technology media such as email, discussion forums, blogs, and YouTube (Heckman et al., 2015). The synchronized blended facility can meet the learning needs of students in both face-to-face and online classes (Yang et al., 2019), as is the case with asynchronous blended learning. Blended learning was conducted face-to-face through scheduled classes, lectures, lab activities, and working hours. Blended learning is mediated by online technology through video conferencing, chat application/WA, and virtual classes/labs (Heckman et al., 2015). The prototype, which includes teaching materials and learning activities based on the 4Cs, is essential to be developed and presented in the place and time of the implementation of blended learning. This is important to prepare more meaningful future learning according to the demands for 21st century skills.

IMPLICATIONS

This research involved a study program of engineering faculty with a sample of four experts, five lecturers, and 34 informatics and computer engineering education students at the Universitas Negeri Makassar, Indonesia. Testing the robustness of this research, qualitative support in the experience of students is needed, which involves various disciplines and a larger sample size to discover deeper conclusions. This current research is limited to only formative evaluation, namely an alpha test for validity and a beta test for practicality, and it cannot broadly extend in summative evaluation to test the effectiveness of the content. This research has valuable implications for higher education in the context of developing and presenting blended learning content that is integrated with 4Cs in the future. If this criterion is explored and well-integrated in blended learning content, it will produce students who have the ability of 4C.

CONCLUSIONS AND RECOMMENDATIONS

The results of the development research

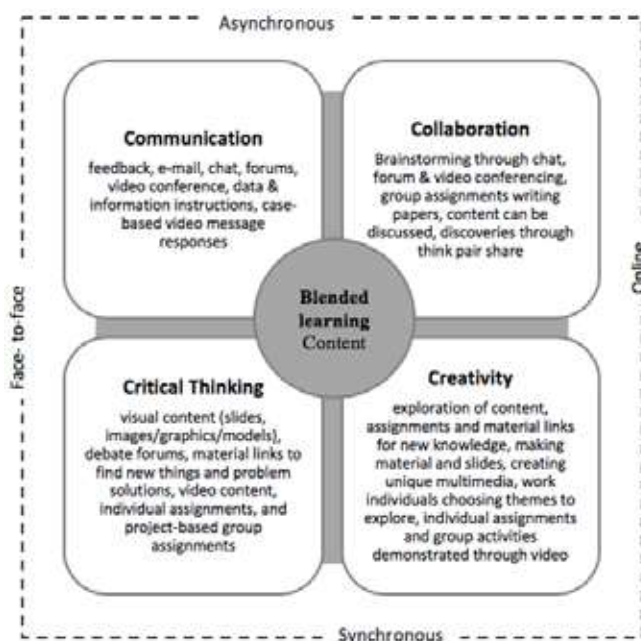


Figure 4. The Empirical Prototype of 4Cs Blended Learning Content

through validity trials (alpha test) showed that all 4Cs indicators of blended learning content were in the very valid category. Notably, the very valid category was shown by the collaboration indicator (98.8%), which contained synchronous and asynchronous facilities for brainstorming, book review group assignment, and writing papers with clear instructions. Meanwhile, the indicator of critical thinking (94.5%) was lower compared to other three indicators. The relevance of the topic at each meeting session was the lowest item on this indicator. Relevance was important, but it was not fundamental to increased creativity, even though the blended learning content was presented as such. The practicality test results (beta test) of the blended learning content for all 4Cs indicators were in the very practical category, especially the critical thinking results from the lecturer assessment (88.1%) and communication results from the student assessment (87%). The results of lecturers' and students' assessments in total showed that communication was in the very practical category compared to the other three aspects. Feedback and written and virtual communication facilities for sharing ideas, knowledge, and learning activities were items that contributed to communication. Separately, between the lecturer and student, the collaboration indicator was in the very practical category, but it was the lowest compared to other three indicators. Book reviews and resumes were the lowest items compared to other items. The group assignments of book reviews and resumes were available in blended content, but it was considered unimportant to improve collaboration skills. Although the test results for each 4C indicator of blended learning content tended to be different, all indicators were in the very valid and practical category. So, it can be said that 4Cs blended learning content development met validity and practicality.

It is expected that further research can investigate this indicator with the help of quantitative and qualitative analysis until the effectiveness test stage. It is essential to study blended learning content and, whether or not it can effectively improve the quality of learning. These indicators for 4Cs-based blended learning content can be developed in context with larger populations and samples.

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