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Needs Analysis of Electronic Student Worksheets to Practice 4C Skills

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Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kebutuhan lembar kerja mahasiswa elektronik (e-LKM) yang melatih keterampilan abad 21: *critical thinking*, *collaboration*, *creativity*, dan *communication* (4C). Penelitian deskriptif kualitatif ini melibatkan 16 dosen dari 7 perguruan tinggi di Indonesia. Instrumen penelitian ini berupa kuesioner yang telah divalidasi oleh dua ahli pendidikan. Kuesioner tersebut dibagikan secara terbuka melalui grup whatsapp dosen dan mahasiswa. Data terkumpul berupa isian kuesioner yang didukung data 25 dokumen lembar kerja mahasiswa yang dikumpulkan dari dosen pengisi kuesioner dan yang tersebar di internet. Data kuesioner diolah dengan teknik persentase sementara data LKM dianalisis berdasarkan standar LKM, berbasis elektronik atau konvensional, menunjang tidaknya ke model pembelajaran tertentu, dan kemunculan keterampilan 4C. Hasil penelitian menunjukkan bahwa masih banyak lembar kerja mahasiswa banyak yang tidak mengikuti standar, tidak berbasis elektronik, belum menunjang model pembelajaran tertentu, dan belum melatih keterampilan 4C. Penelitian ini mengindikasikan perlunya pengembangan lembar kerja mahasiswa elektronik yang melatih keterampilan 4C agar dapat digunakan pada situasi pandemi serta melatih literasi digital dan keterampilan abad 21.

Kata Kunci: critical thinking, collaboration, creativity, communication, lembar kerja mahasiswa elektronik

Abstract

This study describes the needs of electronic student worksheets (e-LKM) that practice 21st century skills: critical thinking, collaboration, creativity, and communication (4C). This qualitative descriptive study involved 16 lecturers from 7 universities in Indonesia. The research instrument is a questionnaire that two education experts have validated. The questionnaire was distributed openly through the lecturers and students' WhatsApp groups. The data was collected in the form of questionnaires supported by data from 25 student worksheets collected from lecturers who filled out the questionnaires and were spread on the internet. Questionnaire data is processed using the percentage technique while LKM data is analyzed based on LKM standards, electronic or conventional based, whether or not it supports specific learning models and the emergence of 4C skills. The results showed that many student worksheets did not follow the standard, were not electronic-based, did not support specific learning models, and did not train 4C skills. This research indicates the need to develop electronic student worksheets that practice 4C skills in pandemic situations and teach digital literacy and 21st-century skills.

Keywords: critical thinking, collaboration, creativity, communication, electronic student worksheets

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INTRODUCTION

The 21st Century is a century where changes occur very quickly, the 21st Century is also called the Century of globalization, the industrial revolution 4.0, knowledge, the age of knowledge-based economy, and the Century of information technology (Redhana, 2019). The 21st Century demands human resources who can compete in mastering various 21st-century skills, namely critical thinking, problem-solving skills, creative thinking skills, metacognition, communication skills, collaboration skills, different literacy (digital, visual, and technology). As well as the ability to live in a career (Ramdani et al., 2019).

The preparation of human resources who master 21st-century skills will be adequate if taken through education. Educators are expected to apply scientific learning in the learning process, but the problem is that knowledge is still teacher-centered. The results in students not optimally mastering 21st-century skills. Therefore, the answer to this problem is a learning reform that shifts teacher-centered learning to student-centered learning (Abidin, 2016). The skills needed in the 21st century are critical thinking, creativity, communication, and collaboration (4C) (Bialik & Fadel, 2015).

The US-based Partnership for 21st Century Skills (P21) identified the competencies needed in the 21st century, namely "The 4Cs" -communication, collaboration, critical thinking, and creativity. These competencies are essential to teaching students in the context of core subject areas and 21st-century themes. Assessment and Teaching of 21st Century Skills (ATC21S) categorize 21st-century skills into four categories: a way of thinking, a way of working, tools for working, and skills for living in the world (Griffin, McGaw & Care, 2012). Way of thinking includes creativity, innovation, critical thinking, problem-solving, and decision making. Way of working has skills to communicate, collaborate, and work in teams. Tools for working include awareness as global and local citizens, life and career development, and a sense of responsibility as personal and social. Meanwhile, skills for living in the world are skills based on information literacy, mastery of new information and communication technologies, and learning and working through digital social networks.

The principle of 21st-century learning is blended learning by combining science, thinking skills (critical, innovation, problem-solving), technology, and research (Graham, 2006). The following changes in 21st-century learning are described in table 1 (Slamet Widodo, 2020).

Table 1
21st Century Learning Changes

Aspects	Before the 21st Century	21st Century
Focus	Teacher-centered	Student-centered
Learning Model	Direct	Interactive
Content	Knowledge	Skill
Process	Result-based	Process-based
Skills	Basic	Applied
Concepts	Facts and principles	Problems and solutions
Study	Theory	Practical
Learning Method	Competition	Collaborative
Place of Learning	Classroom	Global Community
Tasks	Paper Writing	Web-Based
Assessment	Summative	Formative
The Role of Schools	Places of learning	Places of life

Students need to acquire more skills, adaptability, and flexibility in preparing for the future, mainly digital use in various industries in this interconnected and technology-rich world (Anthonysamy et al., 2020). Blended learning that combines face-to-face classroom teaching with digital learning continues to grow in popularity in higher education, to enhance student learning, support collaboration and creativity and equip them with the skills they need to work and live in an increasingly digital world. Digital learning is all types of online or offline

learning whose instructions and content are accompanied by technology (Tang & Chaw, 2015). Along with the times, learning media have changed from conventional to digital, including Student Worksheets (LKM).

Student Worksheets (LKM) are learning tools that are arranged so that the learning process can run well. LKM not only contains material and questions but also has to train the skills of 21st-century students (Rahmawati & Yonata, 2019). LKM is teaching materials and facilities to support the implementation of learning plans in the form of activity sheets containing instructions, material summaries, and steps to complete questions that refer to essential competencies that students must achieve (Hamdani, 2011). The elements in the LKPD include titles, learning guidelines, learning indicators, supporting information, work steps, and evaluations (Prastowo, 2015).

Online learning is the answer to the sustainability of the learning process during the Covid-19 outbreak so that learning using ICT becomes more effective. However, one of the obstacles that occur is the internet network speed which is different from one area to another, making it difficult for students in areas with slow internet speeds (Herdiana, 2020). Worksheets on online learning provide constructive learning opportunities during a pandemic that relies on digital. Using lecture worksheets can run effectively. Worksheets can also replace 4/5 lectures as needed as asynchronous, than in virtual synchronous meetings, students are directed to work on collaborative worksheets (Howley, 2020).

The use of media and learning tools can support online lectures to make the learning process more effective (Herdiana, 2020). Electronic worksheets can impact students' learning activities to be more attractive, interactive, fun, and motivate students to learn. Electronic worksheets can also help students understand and increase their confidence in solving critical thinking questions. The use of electronic worksheets in teaching and learning activities can be more effective, and teachers can carry out creative and innovative learning activities according to the times (Ulfa et al., 2020).

Based on Julian's research (2019), educators need electronic worksheet learning media as an alternative solution to improve students' critical thinking skills in solving problems. Based on Umriani's Research (2019), students' creative thinking ability is still low, as seen in the description questions on the elaboration and original indicator values, which indicate students are not familiar with creative thinking questions. Hence, developing electronic worksheets that train creative thinking skills is necessary. Based on the results of observations in schools, the use of worksheets has not been able to motivate, is less attractive, less effective, and is considered not optimal in encouraging students in the learning process (Rahayu et al., 2021). Based on the data generated in a preliminary study at one of the schools in Padang, it is known that student learning outcomes tend to be low because there is no electronic learning material used, such as electronic worksheets, then the existence of electronic-based worksheets is expected to improve student learning outcomes and motivation when using a smartphone (Mukarromah & Razak, 2020). Now that digital technology has become part of education and is changing how students learn (Tang & Chaw, 2015). Students need to acquire more skills, adaptability, and flexibility in preparing themselves for the future, especially the use of digital in various industries (Anthonysamy et al., 2020) Learning during the pandemic takes place online, so LKM can be made in electronic form or e-LKM so that they can be used and read anywhere and increase knowledge in the use of digital technology.

Many studies have developed Student Worksheets. The development of POE-based LKM to measure critical thinking skills provides a positive response to products and necessary thinking skills (Bemie Eka Saputra, Haerul Pathoni, 2020), but the LKM developed only trains critical thinking skills and has not been integrated online or electronically. The development of the Inquiry-based LKM on the molecular interaction material developed by Yohanes (2021) is in the excellent category. Who can use it in lectures, but this LKM has not trained 21st-century skills and is not based on electronics (Bare & Sari, 2021). From this discussion, there is no electronic student worksheet (e-LKM) as a learning media for 21st-century skills, namely critical thinking and problem solving (Julian, 2019), creativity and innovation (Umriani, 2019), communication (Sapto

et al., 2015), and collaboration (Fitriyani et al., 2019) or called 4C can be trained. Therefore, this article reports the analysis results about the need for electronic Student Worksheets to practice 4C skills.

METHODS

This study describes the needs of e-LKM in terms of the learning model used, conformance to standards, and e-LKM that trains 21st-century skills, namely Critical thinking, Collaboration, Communication, and Creativity (4C). The type of research used is descriptive qualitative, a systematic description of a specific phenomenon factually and accurately about the wonders (Sugiyono, 2018). The research instrument is a questionnaire that two education experts have validated. The questionnaire was distributed openly through the lecturers and students' WhatsApp groups. The data was collected in the form of questionnaires supported by data from 25 student worksheets collected from lecturers who filled out the questionnaires and were spread on the internet. Questionnaire data is processed using the percentage technique while LKM data is analyzed based on LKM standards, electronic or conventional based, whether or not it supports specific learning models and the emergence of 4C skills. The research steps based on (Creswell, 2012) qualitative research methods are (1) Data reduction: summarizing, selecting, and sorting the primary and essential data; (2) Data presentation: based on existing data reduction, then the researcher will describe, explain or interpret and convey in the form of a narrative or a presentation that what can understand correctly and adequately; (3) Conclusion: After the materials or data presented are complete, the researcher concludes in general and in specifics. Lecturers from several public and private universities are the subjects of this research. Demographic information from the respondents is shown in table 2. Sixteen respondents deserve to be processed in this study and achieve a minimum qualitative research sample (Mason, 2010).

Table 2
Respondent Demographic Information

	Variable	Frequency Percentage (%)	
Gender	Male	4	25%
	Female	12	75%
Employment status	PNS	7	43.8%
	Non-PNS	9	56.3%
Working Time	1-5 Years	4	25%
	6-10 Years	6	37.5%
	>15 Years	6	37.5%
Field	Elementary Education	7	43.8%
	Chemistry Education	4	25%
	Science Education	2	12.5%
	Other	3	18.7%
Teaching Place	Universitas Negeri Padang	6	37.5%
	Universitas Sultan Ageng Tirtayasa	5	31.25%
	Universitas Pendidikan Indonesia	1	6.25%
	Politeknik Negeri Bandung	1	6.25%
	STAI Solok Nan Indah	1	6.25%
	Universitas PGRI Kanjuruhan Malang	1	6.25%
	Universitas Langlangbuana Bandung	1	6.25%
University Status	Public	13	81.3%
	Private	3	18.8%

RESULT AND DISCUSSION

Analysis of Respondents' Answer in Terms of Usage LKM Intensity

The answers questionnaire regarding intensity in the use of LKM are divided into the following criteria: "Always" means that the LKM is used continuously in every lecture; "Often" means the LKM is constantly used but not in every course; "Sometimes" means the LKM is used when needed (more than three times); "Ever" means the LKM is used if needed (less than three times); "Never" means not using LKM in every lecture. Table 3 informs the intensity of lecturers in using LKM as teaching materials in lectures.

Table 3
Respondents Answer in Terms of Usage LKM Intensity

Question	Answer Choices Percentage (%)	
Do you use LKM in the lecture process?	Always	0%
	Often	6.2%
	Sometimes	56.3%
	Ever	6.2%
	Never	31.3%

Based on the results of the questionnaire in Table 3, As many as 56.3% of lecturers "sometimes" use LKM, 31.3% of the lecturers "never" use LKM, and 6.2% of the lecturers "ever" and "often" use LKM. The results of the researcher leverage the documents uploaded by the respondents. These results show that many respondents only use LKM if necessary. Based on the data, no one always uses LKM in the learning process, whereas based Ulfa et al. (2020) , the use of electronic worksheets in teaching and learning activities can be more effective, and teachers can carry out creative and innovative learning activities according to the times, especially during the pandemic. LKM need to be used in the learning process. Then the respondents who answered that they had "never" used an LKM stated the following reasons:

- A: "The LKM is not yet available, and they usually use other teaching materials that can support lectures."
- B: "I have not thought about using LKM because I am used to giving assignments orally to students."
- C: "The lecture process runs directly, and assignments are given directly."

For some of these reasons, who can identify that the availability and need for LKM to support lectures can be used as alternative teaching materials, because the use of LKM in learning can be more effective and make it easier for educators to deliver the material (Puspita & Dewi, 2021).

Analysis of Respondents' Answer in terms of LKM preparation

Table 4 shows the results of respondents' answers to follow-up questions for respondents who answered the answer choices "always", "often", "sometimes", and "once" using the LKM. This question aims to find out which LKM is used electronically or conventionally.

Table 4
Respondents Answer in terms of LKM preparation (electronic-based)

Question	Answer Choices Percentage (%)	
Is your LKM electronic-based (filling in online/e-LKM)?	Yes	45.5%
	No	36.4%
	Sometimes	18.2%

As many as 45.5% answered that they were electronic-based, 36.4% still conventional, and 18.2% is sometimes electronic and conventional. After being verified by looking at the uploaded documents, it was found that most LKM is still conventional. So that respondents made a mistake in distinguishing between electronic and conventional-based LKM. The requirements for an electronic document are instructions and the content is accompanied by digital technology, or the filling is done online (Tang & Chaw, 2015). There is a need for the development of electronic-based LKM. In addition to training students' digital literacy, the current learning

process changes more towards digital so that students are trained to prepare for the future, especially the use of digital in various industries (Anthonysamy et al., 2020).

Table 5 shows the results of respondents' answers related to the preparation of the LKM, aimed at knowing the LKM used by the lecturers was prepared by themselves or by someone else.

Tabel 5
Respondents Answer in terms of LKM preparation

Question	Answer Choices	Percentage (%)
Was your LKM prepared by yourself?	Yes	81.8%
	No	0%
	With a team	18.2%

As many as 81.8% of the LKM were prepared by themselves, 18.2% were arranged with a team because several lecturers taught courses preparation LKM done together. According to the uploaded document, the answer is verified and shows that the preparation is not according to LKM standards. LKM preparation must meet various requirements, namely didactic requirements, construction requirements, and technical requirements (Widjajati, 2008). The elements in the LKM include titles, learning guidelines, learning indicators, supporting information, work steps, and evaluations (Prastowo, 2015). Besides documents uploaded by respondents, researchers also searched LKM documents scattered on the internet. Then researchers analyzed according to LKM standards shown in table 8.

LKM based on learning models can help achieve learning objectives that are arranged (Derlina et al., 2014). Table 6 shows the results of respondents' answers aim to determine the LKM was used to support specific learning or not.

Tabel 6
Respondents Answer in terms of LKM preparation (model-based)

Question	Answer Choices	Percentage (%)
Is the Student Worksheet that you use based on a learning model (the stages of filling it out follow the syntax of the learning model used)?	Yes	81.8%
	No	0%
	Sometimes	18.2%
If the LKM that you use is based on a learning model, what model is the basis for its preparation?	Problem Based Learning	33.3%
	Project-Based Learning	66.7%
	Learning Cycle	0%
	Inquiry/Discovery Learning	22.2%
	Other	11.1%

Based on the answers to the questionnaire, 81.8% answered yes, and 18.2% answered sometimes. The next question is related to the learning model used in the LKM. As many as 66.7% use the Project-Based Learning model, 33.3% use Problem-Based Learning, 22.2% use the Inquiry/Discovery Learning model, and 11.1% use other models. After the data is verified with the uploaded LKM document, it is known that some LKM does not fully support specific learning models. The syntax does not indicate a specific model, only contains instructions that students must do or only includes assignments. Model-based in LKM are usually structured with clear syntax.

Analysis of Respondents' Answer in Terms of the 4C Skills Trained by LKM

The assessment of 4C skills on this question is subjective. The 4C assessment requires a separate instrument to provide accurate results. This question describes lecturers' evaluation of 21st-century skills applied in their LKM. Respondent uploaded the LKM document on the questionnaire form researcher analyzed it to verify the answers. Table 7 shows the respondents' responses regarding the trained 4C skills.

Tabel 7
Respondents Answer in Terms of the 4C Skills Trained by LKM

Question	Answer Choices	Percentage (%)
In your opinion, do the LKM that you use have trained 21st-century skills? (Please tick the skills taught when using the LKM, more than one answer are allowed)	Critical thinking skills	90.9%
	Communication skills	27.3%
	Collaborative skills	36.4%
	Creative skills	36.4%

Most LKM made by respondents teach critical thinking skills by 90.9%. Collaborative and creative skills 36.4%, and the lowest is communication skills, only 27.3%. This data shows that most LKM can train critical thinking skills, but LKM used by respondents only can train one until two 21st century skills, so we need to develop LKM that can teach these four skills.

Analysis of LKM Spread on the Internet

LKM documents uploaded by respondents to the questionnaire can verify the answers given. Besides these documents, researchers are looking for other documents sourced from the internet (academia.edu, studoc.com, slideshare.com, adoc.pub). Most of the LKM samples analyzed are still conventional and not electronic (filling in done online).

Standard LKM usually contains elements in the LKM, including titles, learning guidelines/instructions, learning indicators, supporting information, work steps, and evaluations (Prastowo, 2015), as well as the preparation of the LKM must meet various requirements, namely didactic requirements, construction requirements, and technical requirements based Widjajati (2008): didactic requirements, construction requirements, and technical requirements.

The assessment for practice 21st-century skills, based on many experts, has developed the evaluation to measure 21st-century skills (Abidin, 2016). Skills assessment is based on the model developed by Binkley et al. (2012), which presents a measurable description of each 21st-century skill assessment. The domain of critical thinking and problem-solving skills knowledge is assessed based on evaluating evidence and analyzing points of view in solving problems.

Creativity and innovation skills in the Indonesian curriculum are usually reflected through the products produced by students, such as essays, literary works, pictures, simple technology, and so on. Collaborative skills are generally assessed based on working together and interacting with other people in the team. Communication skills are usually evaluated by presenting discussion results and problem-solving results. Aspects of these skills should be trained in the preparation of the LKM.

Table 8 shows the results of the analysis of LKM spread on the Internet in terms of the standards, learning models used and train 21st-century skills.

Table 8
LKM Analyze

Sample LKM	Elements in LKM					Model base	Requirements			Practice 21st Century skills			
	Cover/Title	Instruction	Indicator	Work Steps	Evaluation		SD	SK	ST	CT	CR	CB	CM
LK1	1	1	1	1	1	0	0	0	0	1	0	0	0
LK2	1	1	1	1	1	1	1	1	1	1	1	1	1
LK3	1	1	1	1	1	0	1	1	1	1	0	0	1
LK4	1	1	1	1	1	1	1	1	1	1	1	1	1
LK5	1	1	1	1	1	1	1	1	1	0	0	0	0
LK6	1	0	0	0	1	0	0	0	0	0	0	0	0
LK7	1	1	1	1	1	0	1	1	1	1	0	1	1
LK8	1	0	0	0	1	0	0	0	0	1	0	0	0
LK9	1	1	1	1	1	0	1	1	1	1	0	1	1
LK10	1	0	0	0	1	0	0	0	0	0	0	0	0
LK11	1	0	0	0	1	0	0	0	0	0	0	0	0

LK12	1	0	0	0	1	0	0	0	0	1	0	0	0
LK13	1	0	0	0	0	0	0	0	0	0	0	0	0
LK14	1	1	0	1	1	0	0	0	0	0	0	0	0
LK15	1	1	1	1	1	0	1	1	1	1	0	1	1
LK16	1	1	1	1	1	0	1	1	1	0	1	0	0
LK17	1	0	0	0	1	0	0	0	0	0	0	0	0
LK18	1	1	0	0	1	0	1	0	0	1	1	0	0
LK19	1	1	1	1	1	0	1	1	1	0	0	0	0
LK20	1	1	1	1	1	0	1	1	1	1	0	1	1
Total	20	13	11	12	19	3	11	10	10	11	4	6	7
%	100%	65%	55%	60%	95%	15%	55%	50%	50%	55%	20%	30%	35%

Keterangan: 1= Fulfil 0= Not Fulfil, SD= Syarat Didaktik, SK= Syarat Konstruk, ST= Syarat Teknis, CT= Critical Thinking, CR= Creativity, CB= Colaboration, CM= Communication

Based on the analysis results in table 8, the sample of LKM analyzed has the minimum elements must be present in LKM have met almost more than 60%, while the LKM requirements need to be increased because they are still in the range of 50-55%. Many of the LKM that researchers analyzed only contained questions without adding instructions, indicators, and work steps. Even though these elements are essential to write down so that students can work on the LKM according to the learning objectives to be achieved, thus, the low addition of LKM elements can be concluded that there is a need to increase knowledge about the elements used in LKM.

Based on findings for the model base of the LKM, only 15% of model-based LKM, or about three out of twenty LKM, use learning models. Based on the analysis results, it was found that the model-based LKM did not fully support the model because the syntax of the model used was not structured. Whereas according to Derlina et al. (2014), LKM based on learning models can help achieve arranged learning objectives. The results of the analysis report that it is necessary to compile an LKM that supports a particular model with a syntax that describes that model.

Based on findings for the preparation of the LKM, the results show that only about 50%-55% are following the requirements. Most of the LKM analyzed only gave assignments to students without providing any lessons beforehand. The preparation of the LKM needs to pay attention to three conditions: SD, SK, and ST because these conditions are essential in the quality and success of the LKM in achieving learning objectives.

Regarding 21st-century skills in the analysis results, LKM has indicators of critical thinking, creativity, collaboration, and communication skills of 55%, 20%, 30%, and 35%, respectively. These results report that low LKM train the four 21st century skills. Most LKM only contain low order thinking, no indicators of cooperation, and do not foster student creativity. According to Ramdani et al. (2019), the need to prepare human resources who can compete in the current era to face the world of work demands 21st-century skills, namely critical thinking, creativity, collaboration, and communication skills. So, it is necessary to develop an LKM that is standard-based, model-based, and train 4C skills.

CONCLUSION

The existing worksheets in the field are not fully standardized, do not support specific learning models, and have not trained 21st-century skills. It is necessary to develop student worksheets according to standards (fulfil didactic requirements, construction requirements, and technical requirements, and contain elements including titles, learning guidelines/instructions, learning indicators, supporting information, work steps, and evaluations), that help specific models, and LKM must teach 21st-century skills in the electronic form to fill out online. This research can be used as a reference for developing e-LKM based on learning models, according to standards, and training 21st-century skills.

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