

Digitalization on TVET, as an Effective Learning Materials & Media

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RAVTE

Regional Association of Vocational
and Technical Education in Asia



TVETRC

THE VOCATIONAL AND TECHNICAL
EDUCATION RESEARCH CENTER



ADGVI

PAPTEKINDO



UPI

The Education
University



FPTKUPI

FOCUS

Freezing:

1. Beneficial;
2. Have kindness;
3. Rewarded.



Beneficial

- ▶ For Yourself:
Teaching Materials, Learning Media,
Cumulative points, Intellectual Property
Rights, etc.
- ▶ For Institutions/other people/students:
Learning materials, dissemination of knowledge,
examples of kindness, **recognition**, etc.



Product Example: Learning Media that makes an impression

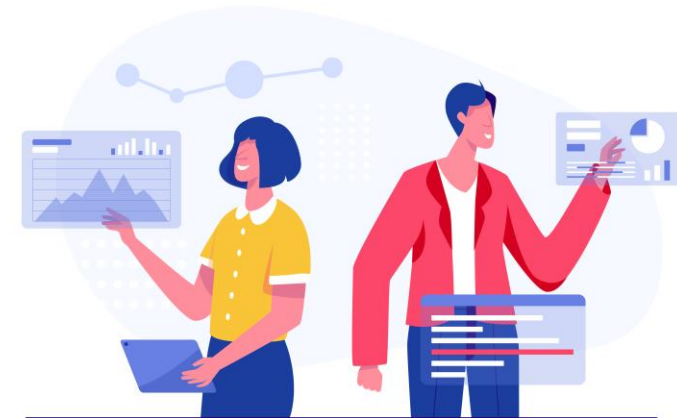
a. Learning Media,

b. Certificate:

1. Intellectual property rights,
2. National Seminar,
3. International Seminar,

c. Article:

1. National Seminar Proceedings
2. International Seminar Proceedings,
3. National Journal (accredited and non accredited)
4. International Journal (Reputable)
5. Scopus Indexed International Journal.



List of Example of an Imprinting Learning Media

- ▶ Animation Multimedia
- ▶ Android Based Multimedia
- ▶ Video based media
- ▶ Augmented Reality (AR)
- ▶ Virtual Reality (VR)



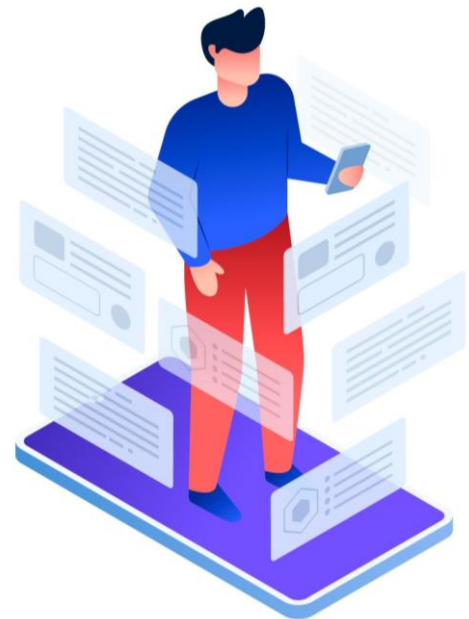
Examples of Multimedia Animation (MMA)

- ▶ Atomic Crystal Structure MMA
- ▶ Atomic Sliding Plane MMA
- ▶ Atomic Crystal Defect MMA
- ▶ Phase Diagram MMA



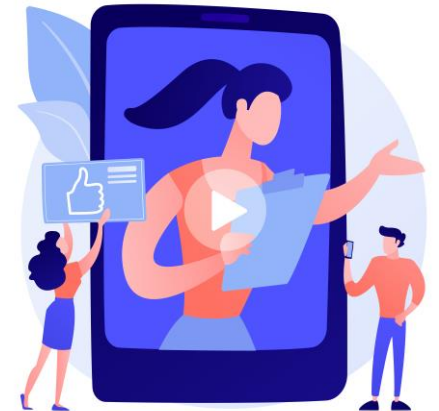
Examples of Android Based Multimedia (Mobile Learning)

- ▶ Mobile Learning of Atomic Crystal Structure,
- ▶ Mobile Learning of Eutectic Phase Diagrams,
- ▶ Mobile Learning from Peritectic Phase Diagrams

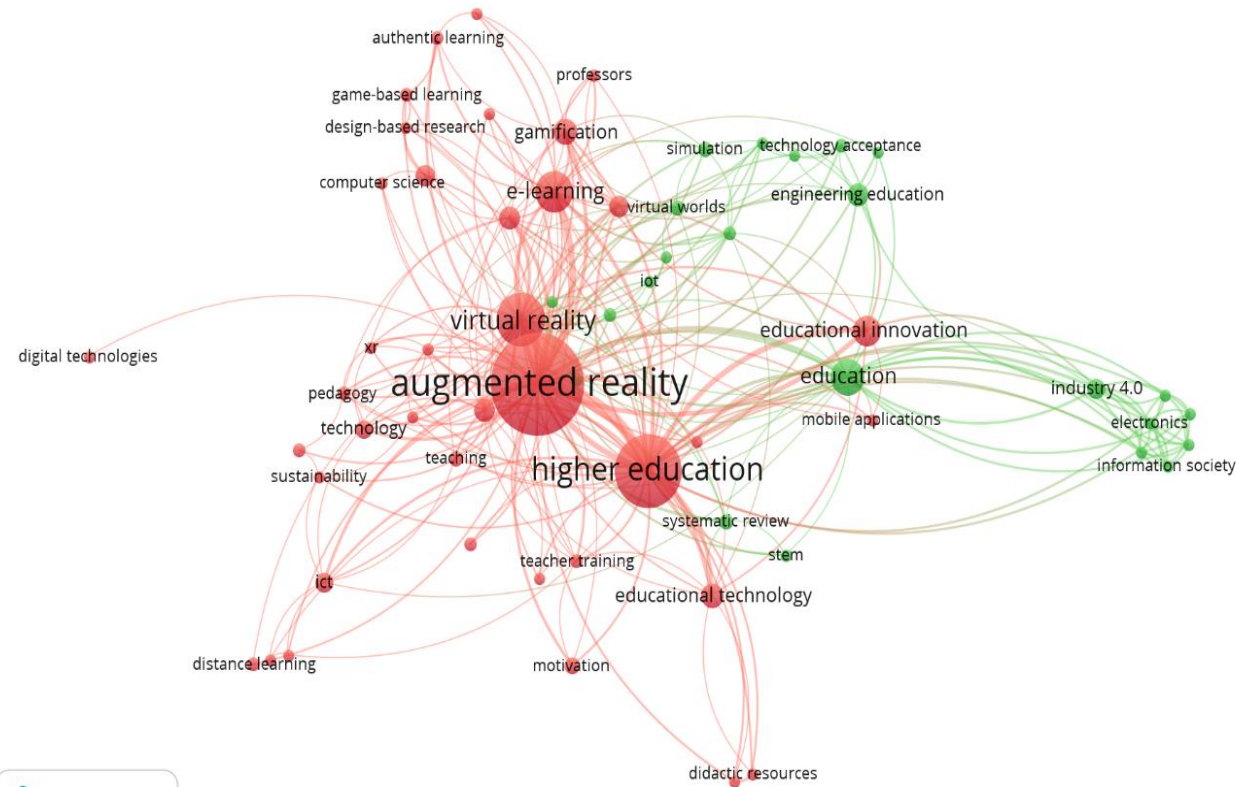


List of Example of Video-Based Media

- ▶ Video-based Media for Lathe Learning



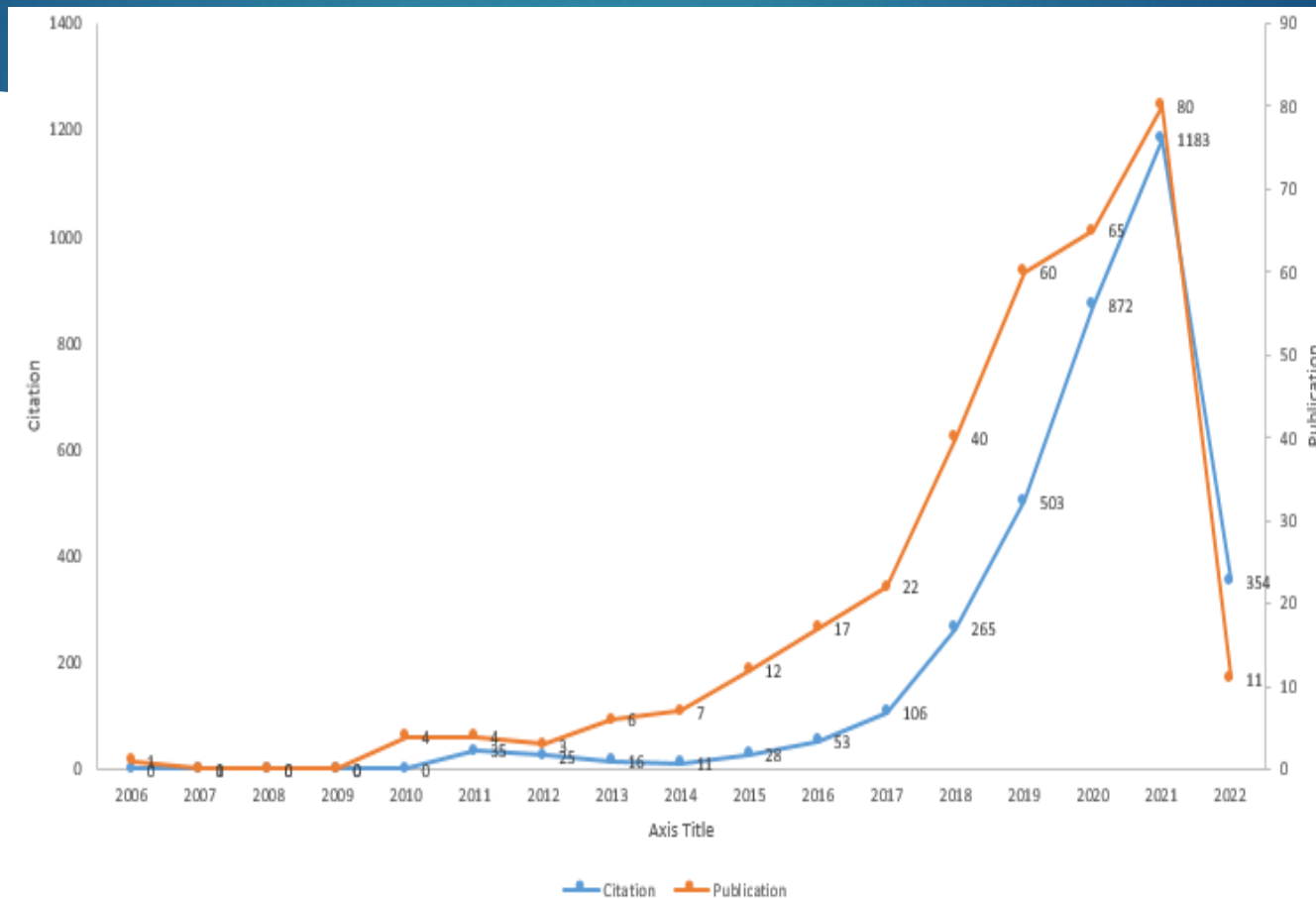
Augmented Reality



VOSviewer

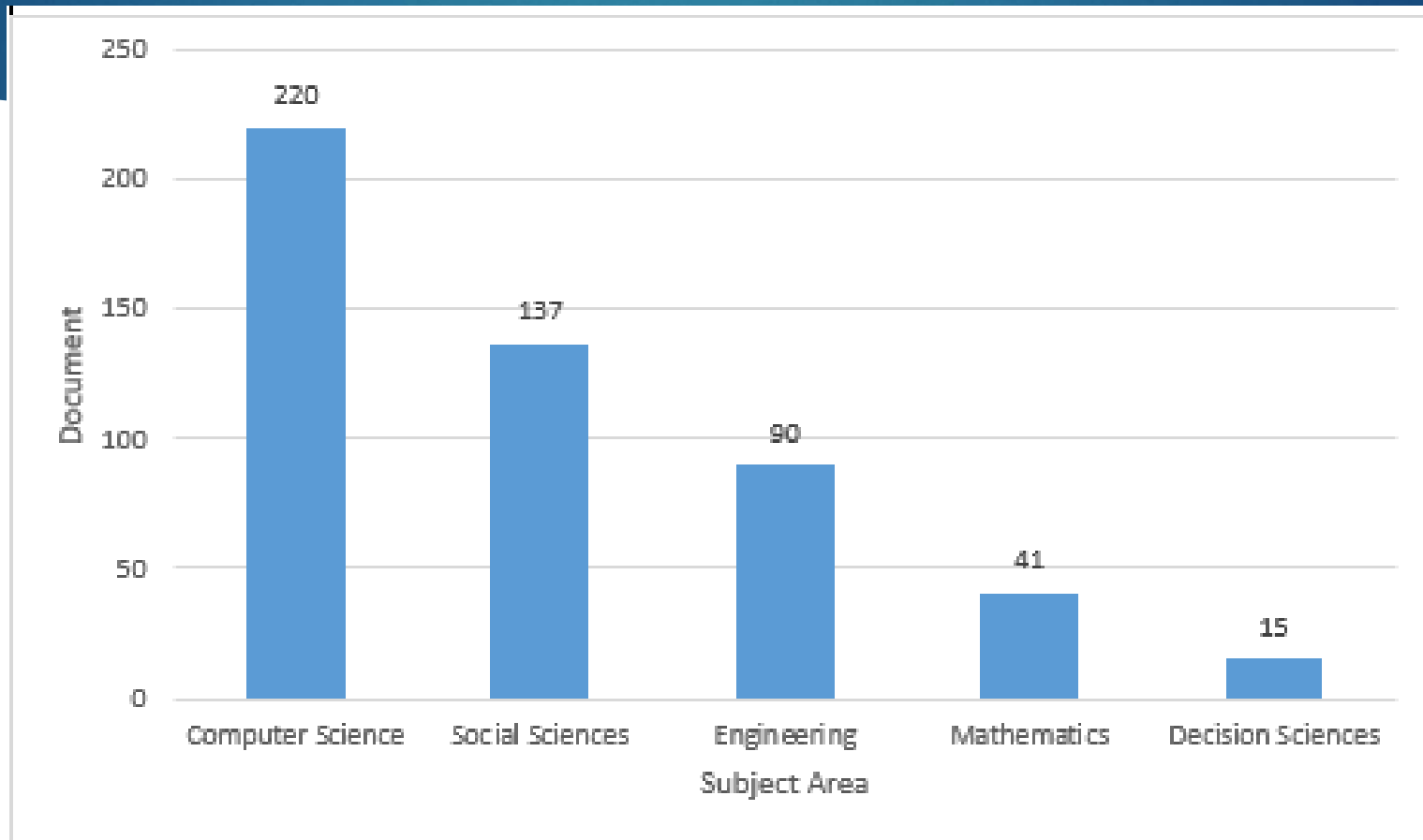
Keyword Analysis (Utami, et al, 2022)

Augmented Reality



Publications and citation trends in AR
from 2006-2022 (Utami, et al, 2022)

Augmented Reality



Research productivity based on subject area (Utami, at all, 2022)

Examples of Multimedia Animation (MMA)

- ▶ Atomic Crystal Structure MMA
- ▶ Atomic Sliding Plane MMA
- ▶ Atomic Crystal Defect MMA
- ▶ Phase Diagram MMA

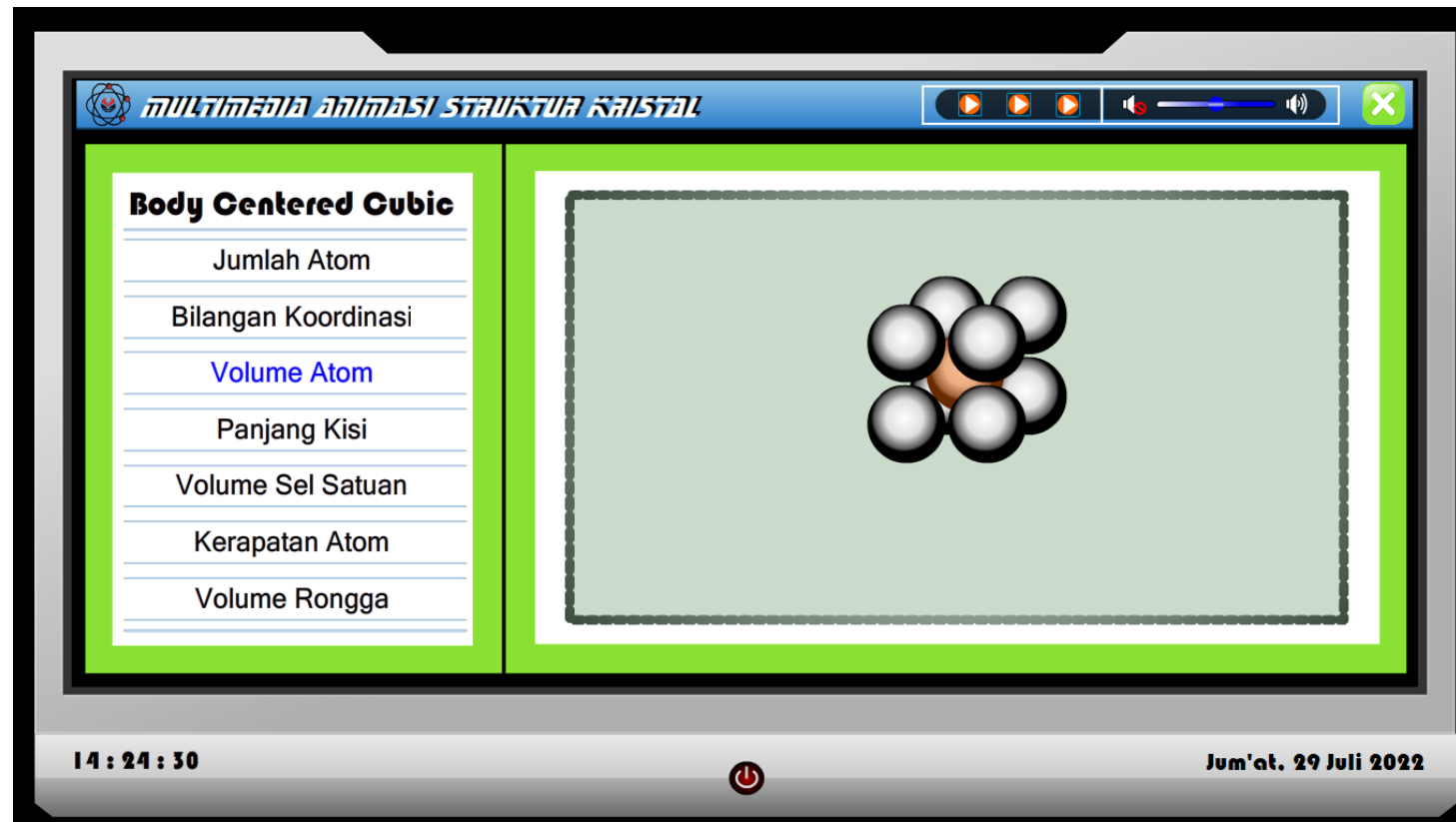
Examples of Multimedia Animation (MMA)

Atomic Crystal Structure MMA



Examples of Multimedia Animation (MMA)

Atomic Crystal Structure MMA



Examples of Multimedia Animation (MMA)

Atomic Crystal Structure MMA

MULTIMEDIA ANIMASI STRUKTUR KRISTAL

Hexagonal Close Packed

Jumlah Atom

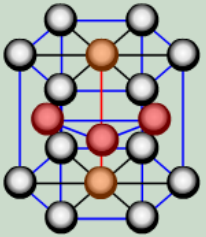
Volume Sel Satuan

Body Centered Tetragonal

BCT

Jumlah Atom

**Heksagonal Susunan Rapat
atau
Hexagonal Close Packed (HCP)**



16 : 49 : 48

Jum'at, 29 Juli 2022

Examples of Multimedia Animation (MMA)

Atomic Crystal Structure MMA

Development of Android-based Multimedia to Improve
Student Learning Outcome in Crystal Structure Subject of
Engineering Materials Course

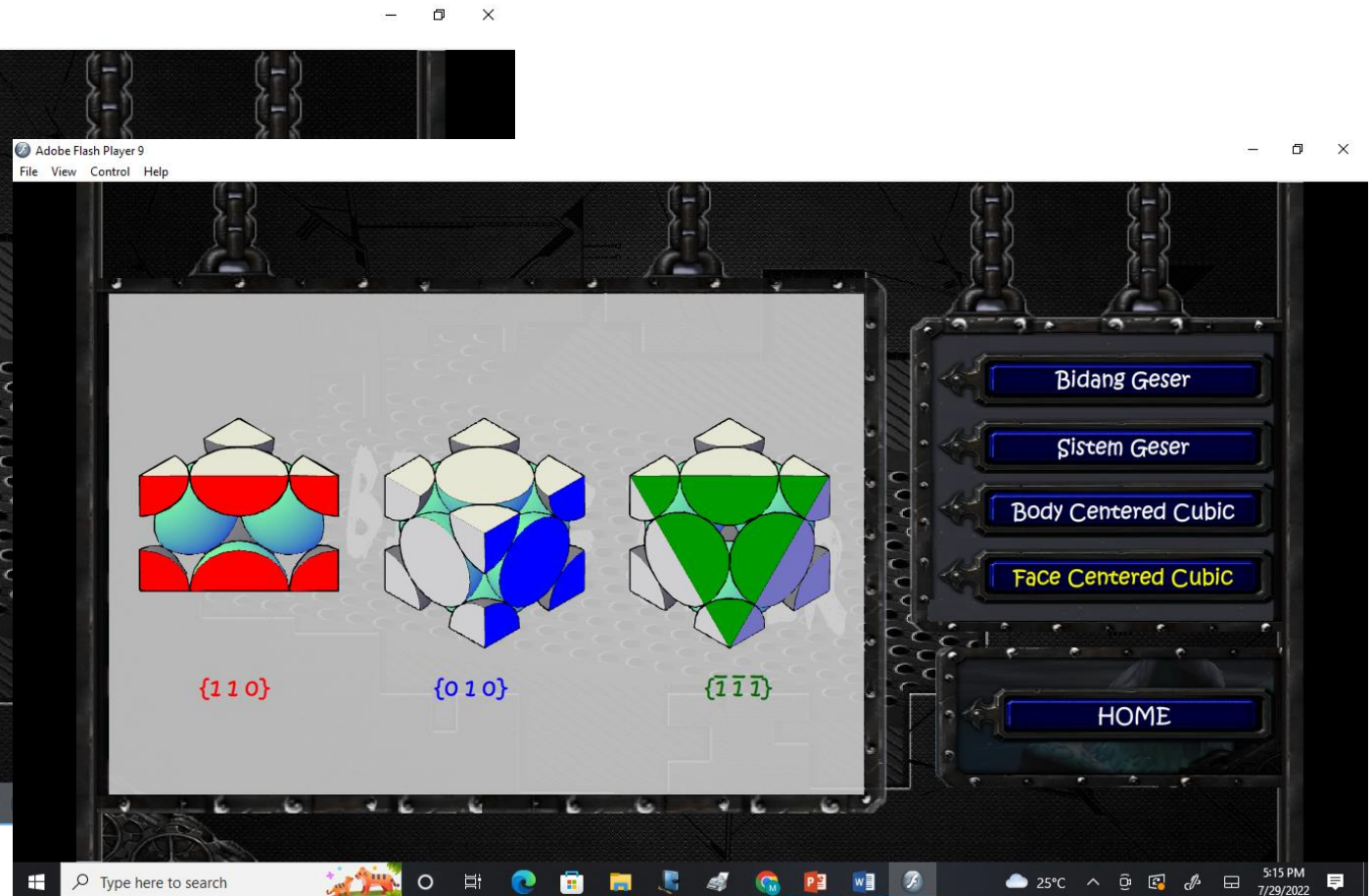
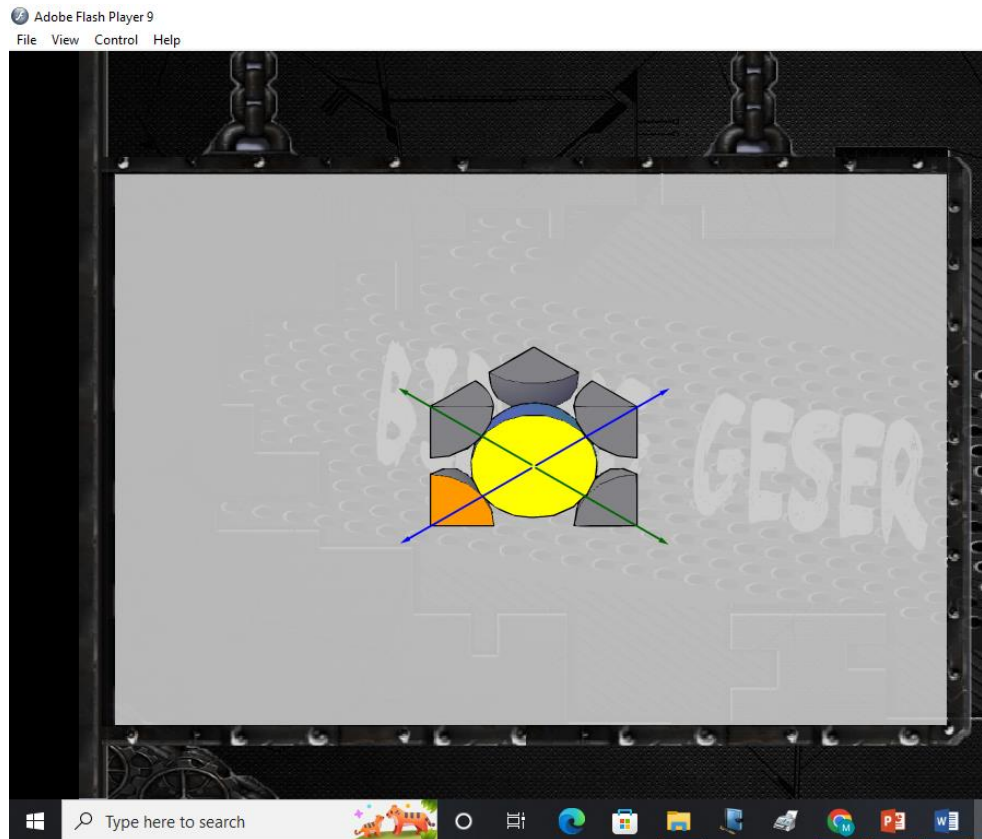
TABLE 4
STUDENT LEARNING OUTCOME RESULTS

Control Group					
No	Aspects	Pretest	Posttest	N-gain	Category
Students		18			
1	Average	31,7	73,4	0,61	Medium
2	Highest Score	41,0	95,0		
3	Lowest Score	15,0	30,0		
Experimental Group					
No	Aspects	Pretest	Posttest	N-gain	Category
Students		18			
1	Average	30,5	95,6	0,94	High
2	Highest Score	42,0	99,0		
3	Lowest Score	9,0	90,0		

(Komaro, 2022)

Examples of Multimedia Animation (MMA)

Atomic Sliding Plane MMA



Examples of Multimedia Animation (MMA)

Atomic Sliding Plane MMA

Adobe Flash Player 9

File View Control Help



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Adobe Flash Player 9

File View Control Help



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Bidang Geser

Sistem Geser

Body Centered Cubic

Face Centered Cubic

HOME

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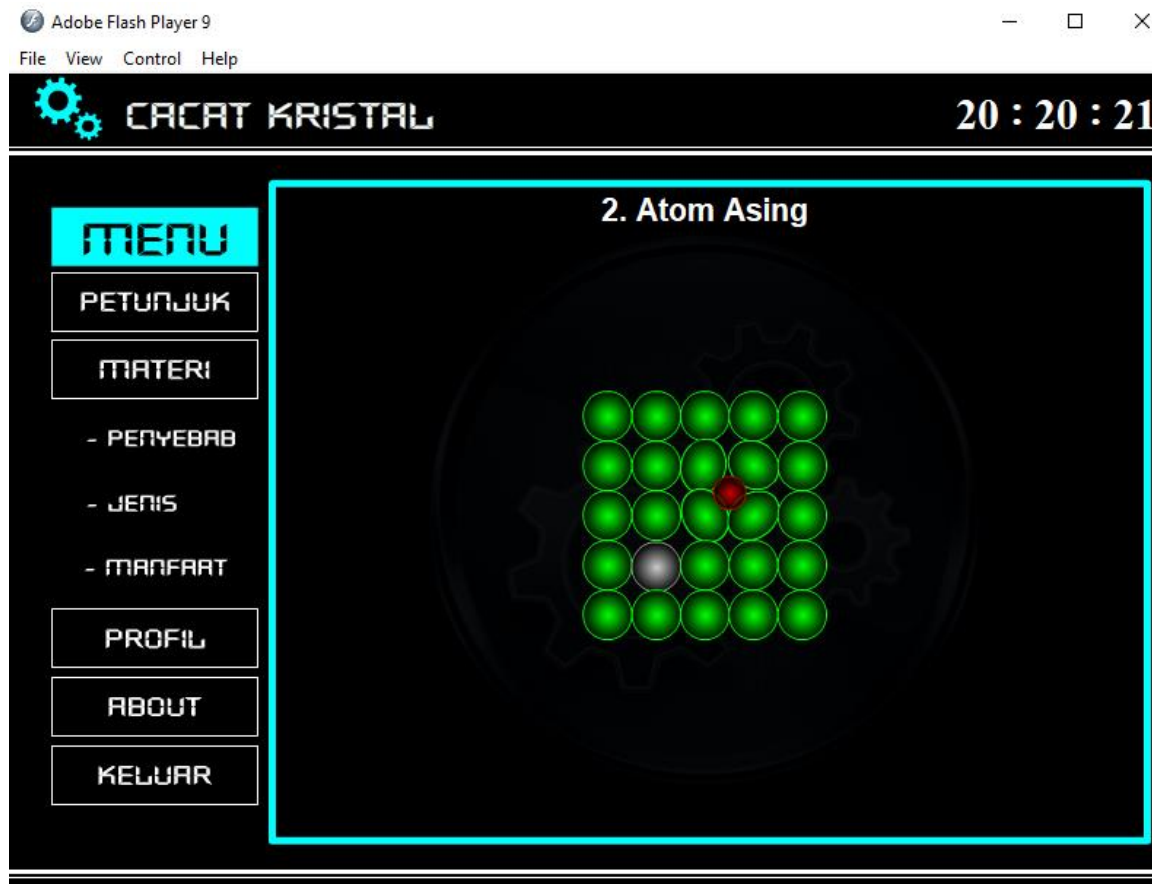
Examples of Multimedia Animation (MMA)

Atomic Sliding Plane MMA



Examples of Multimedia Animation (MMA)

Atomic Crystal Defect MMA



Examples of Multimedia Animation (MMA)

Atomic Crystal Defect MMA



Examples of Multimedia Animation (MMA)

Atomic Crystal Defect MMA

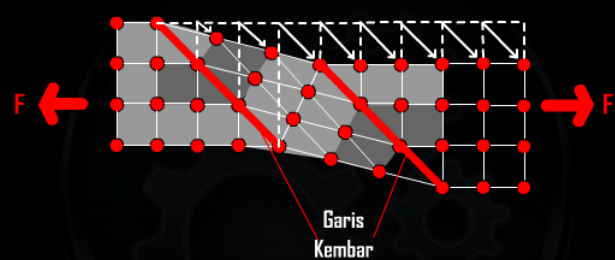
Adobe Flash Player 9
File View Control Help

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CACAT KRISTAL

MENU

- PETUNJUK
- MATERI
 - PENYEBAB
 - JENIS
 - MANFAAT
- PROFIL
- ABOUT
- KELUAR



Garis Kembar

Cacat garis kembar (Twin) biasanya hanya terjadi pada material FCC. Antara butiran satu dengan butiran lainnya merupakan cerminan dan ini menimbulkan cacat pada daerah batas butir.

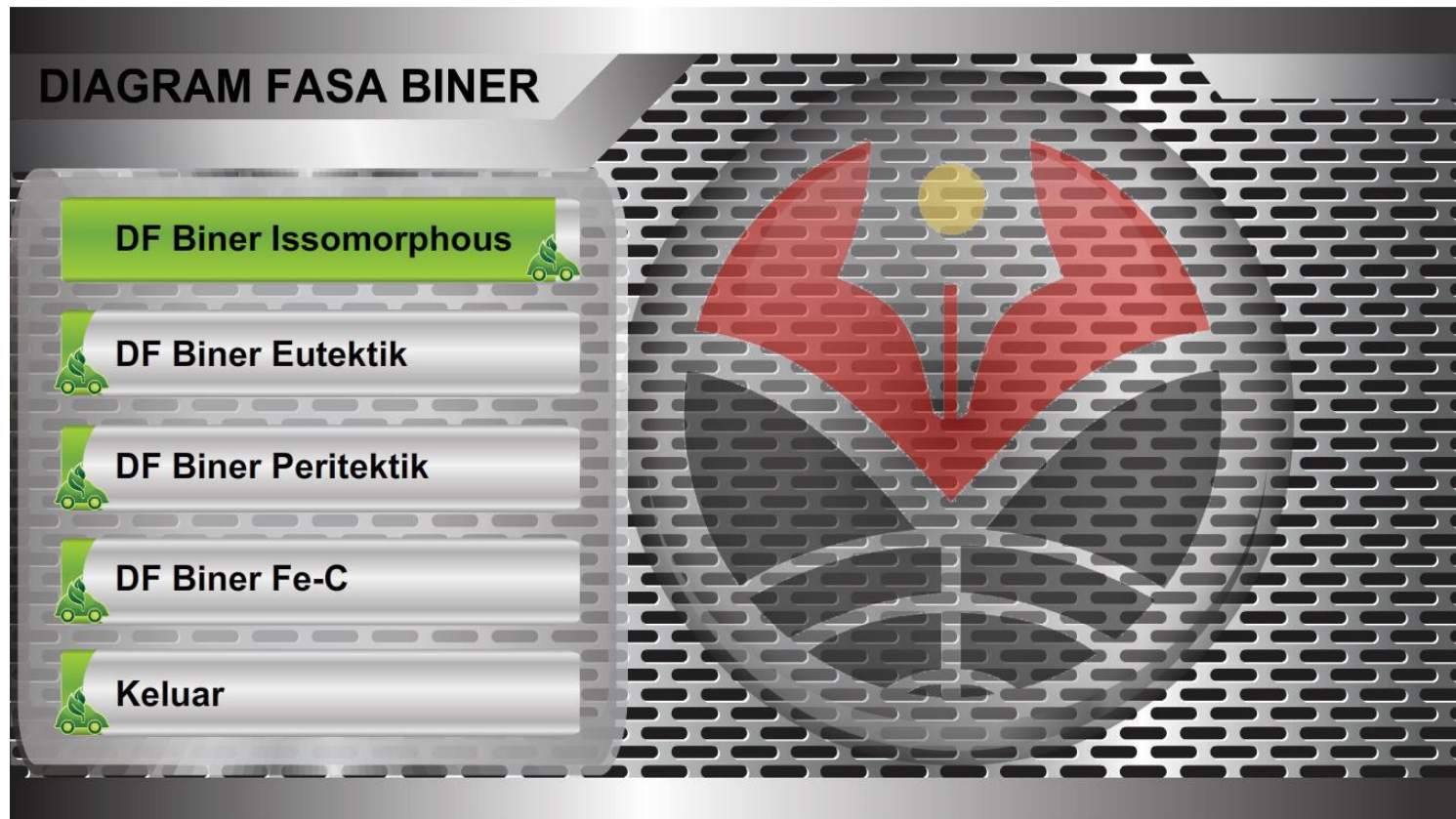
Jumat, 29 Juli 2022

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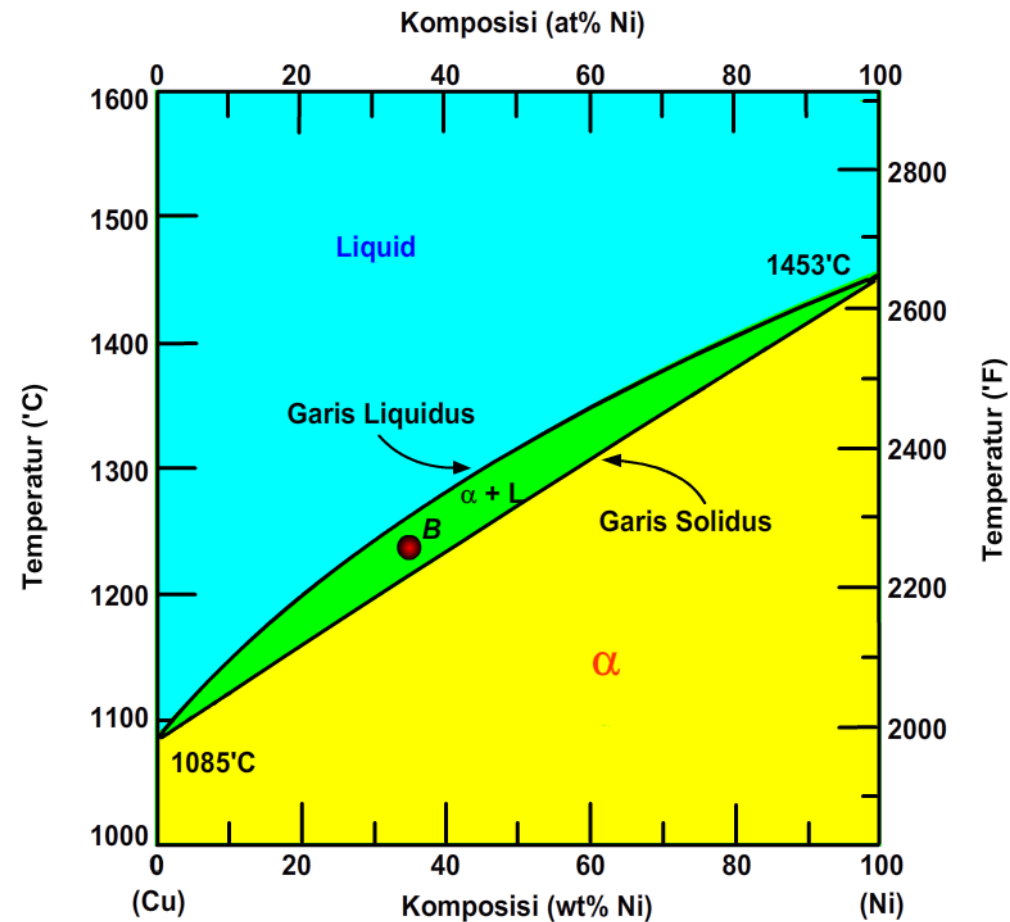
Examples of Multimedia Animation (MMA)

Phase Diagram MMA



Examples of Multimedia Animation (MMA)

Phase Diagram MMA

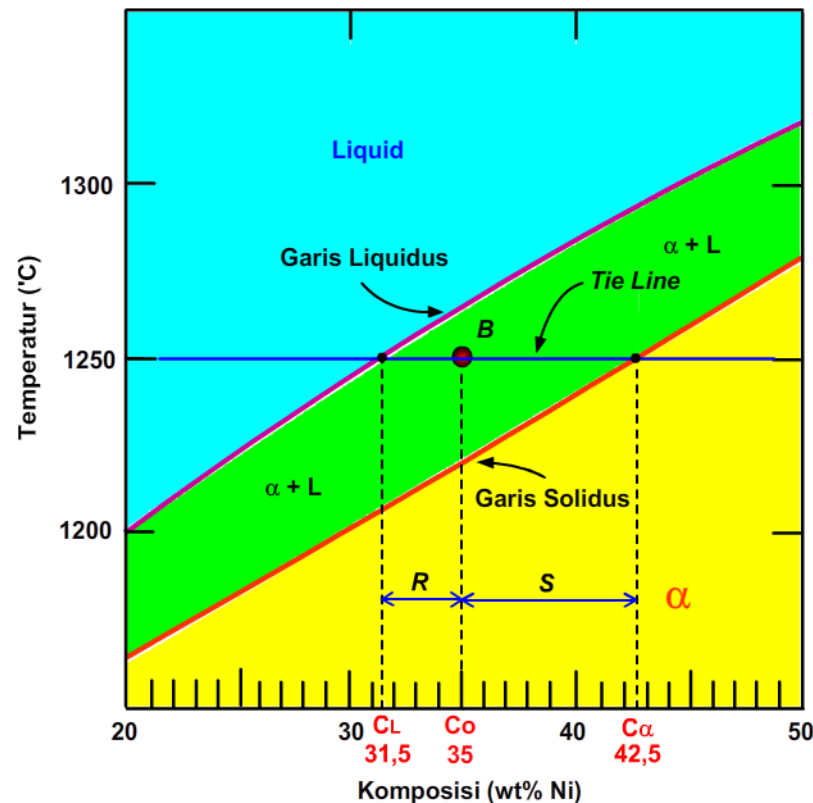


Examples of Multimedia Animation (MMA)

Phase Diagram MMA

Adobe Flash Player 9
File View Control Help

— □ ×



Fasa Cair (W_L)

$$\begin{aligned} W_L &= \frac{S}{R + S} \\ &= \frac{C_\alpha - C_o}{C_\alpha - C_L} \\ &= \frac{42,5 - 35}{42,5 - 31,5} \\ &= 0,68 \times 100 = 68\% \end{aligned}$$

Fasa Padat (W_α)

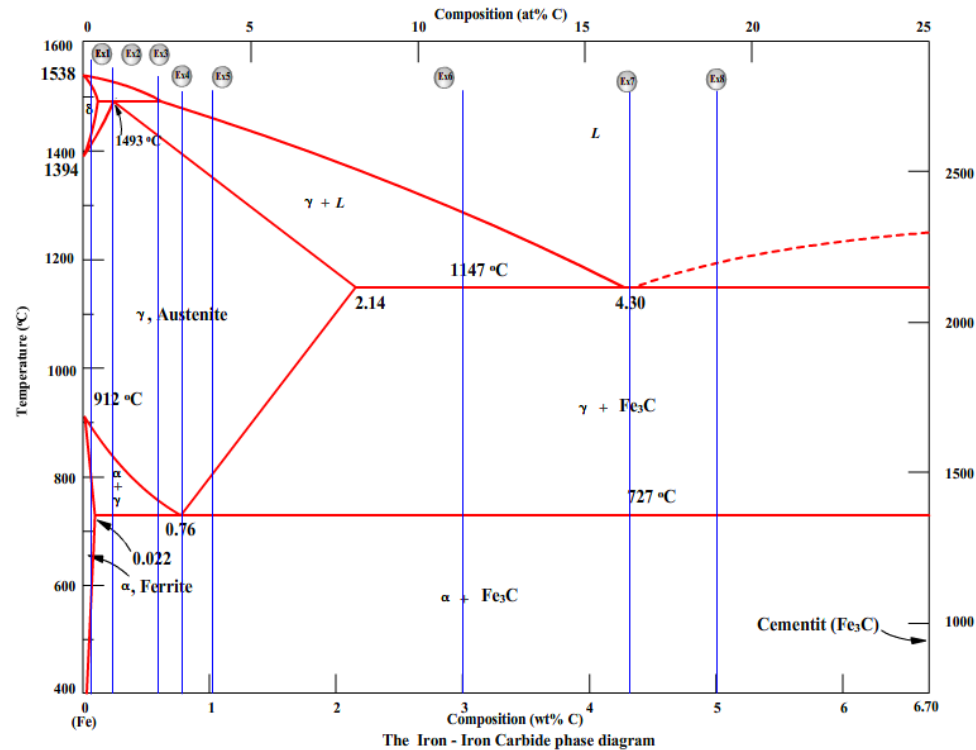
$$\begin{aligned} W_\alpha &= \frac{R}{R + S} \\ &= \frac{C_o - C_L}{C_\alpha - C_L} \\ &= \frac{35 - 31,5}{42,5 - 31,5} \\ &= 0,32 \times 100 = 32\% \end{aligned}$$

HOME

Examples of Multimedia Animation (MMA)

Phase Diagram MMA

Macromedia Flash Player 8
File View Control Help

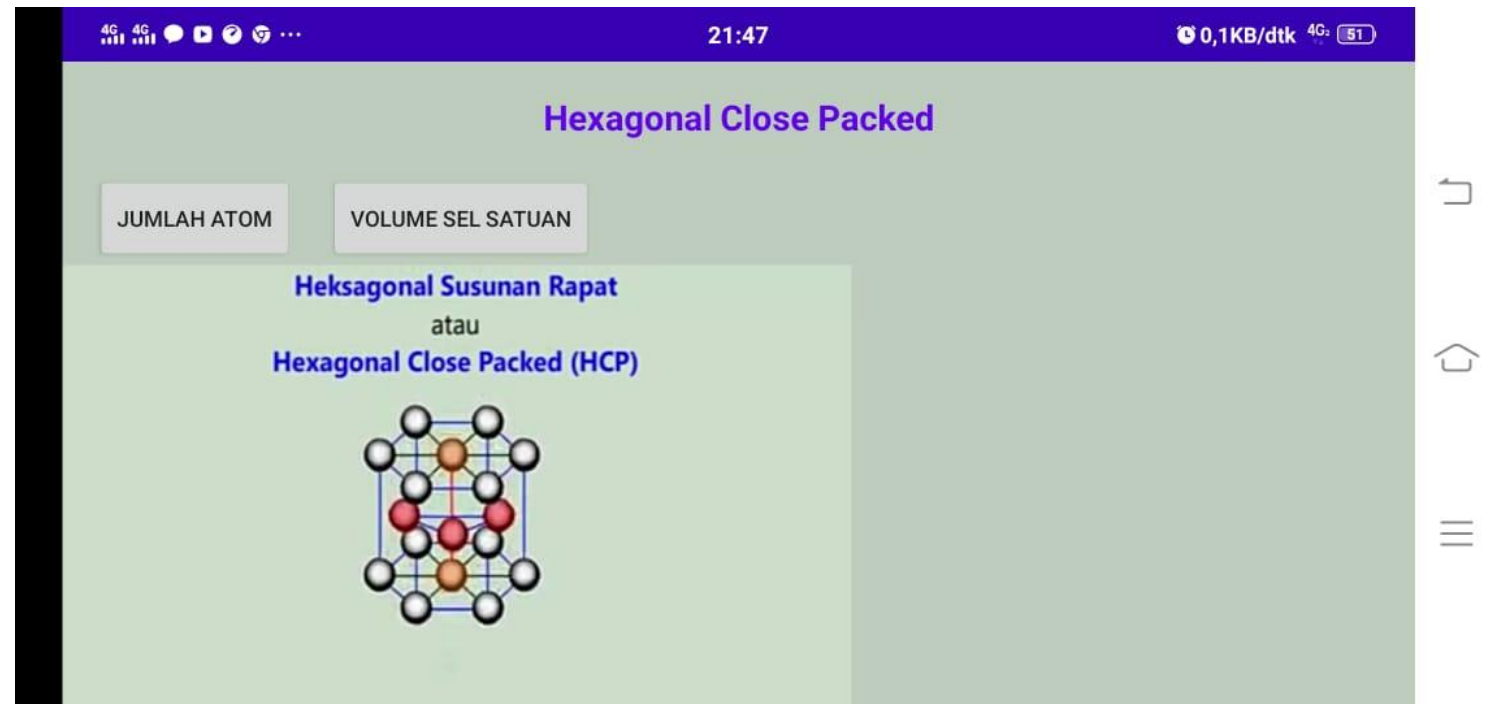
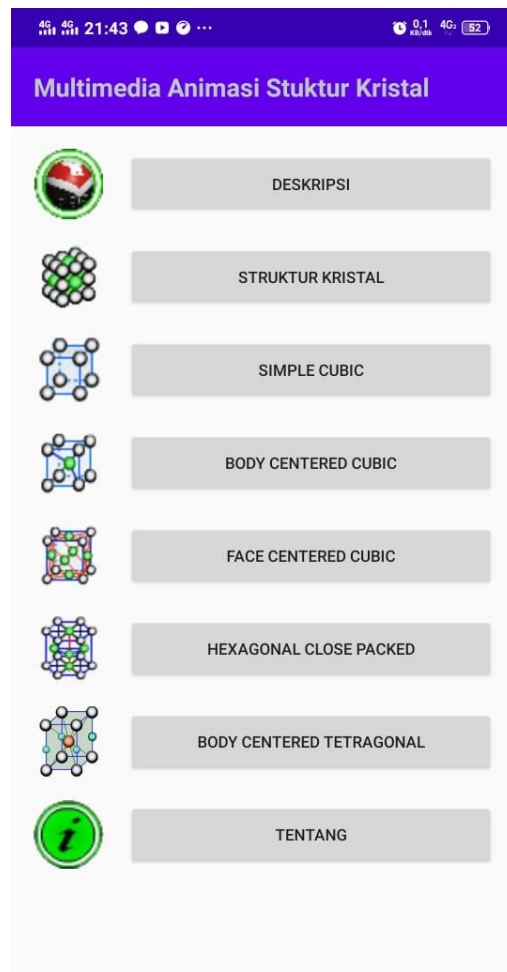


MANUAL

AUTO

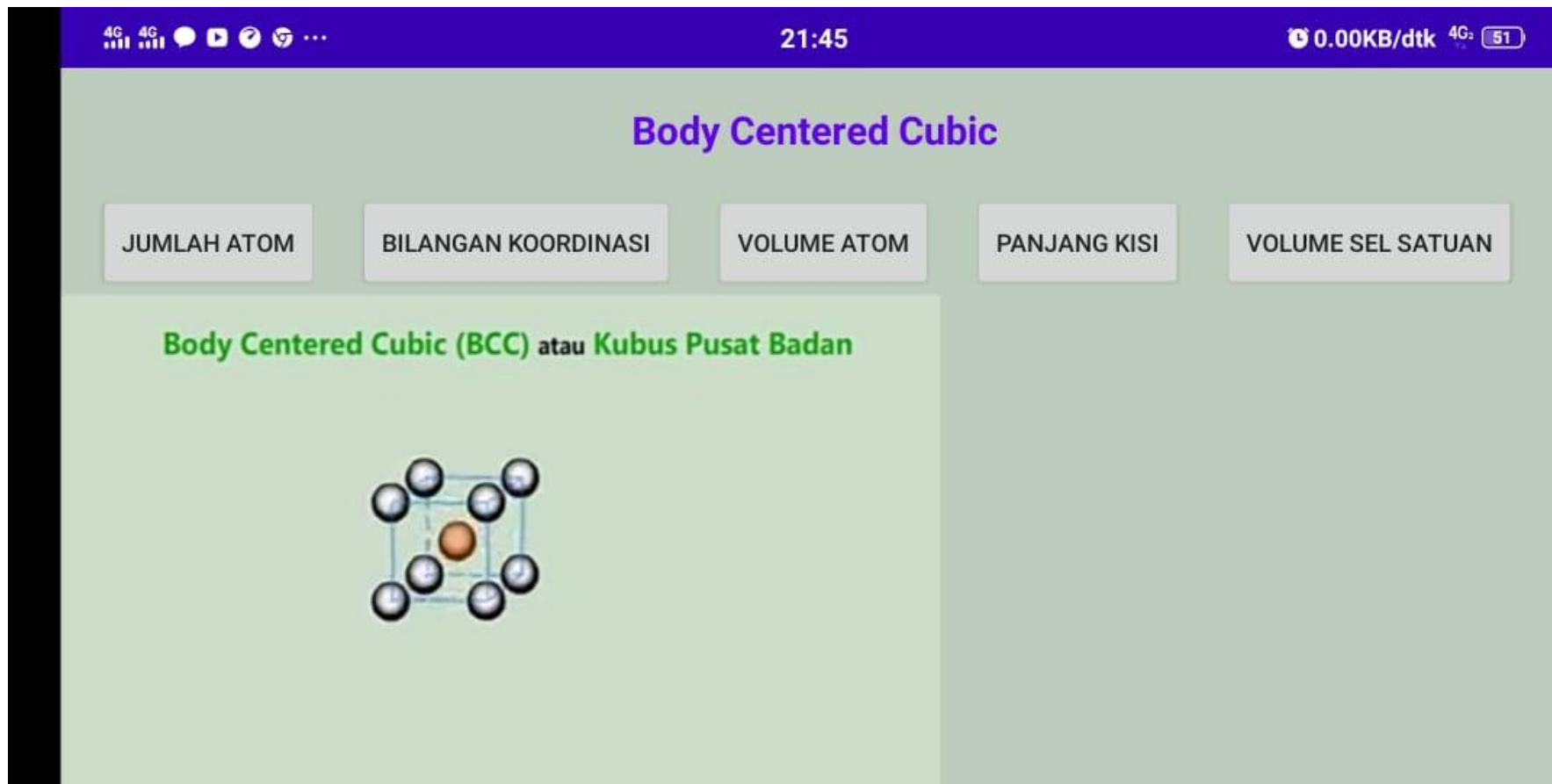
Example of Android Based Multimedia (Mobile Learning)

Mobile Learning of Atomic Crystal Structure



Example of Android Based Multimedia (Mobile Learning)

Mobile Learning of Atomic Crystal Structure



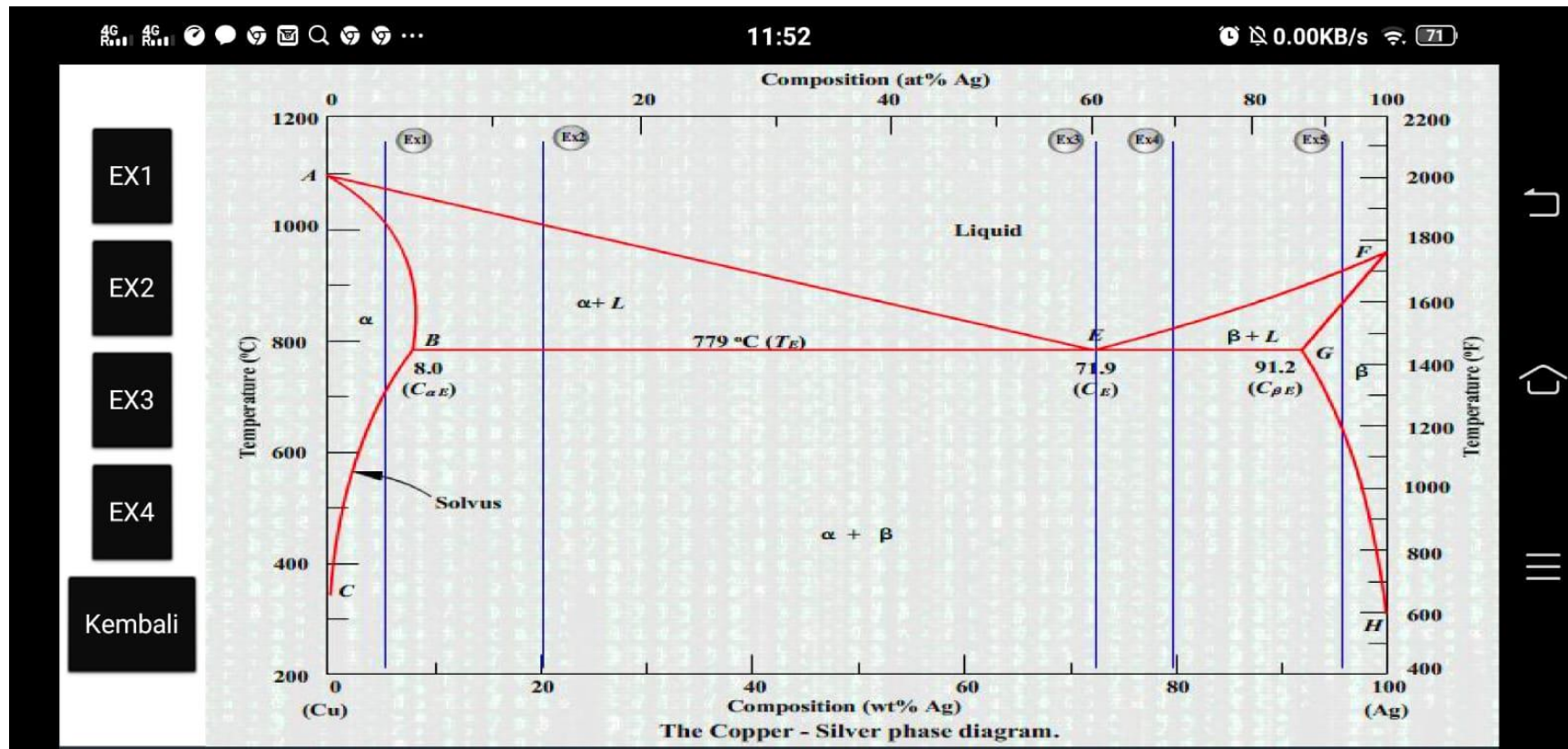
Example of Android Based Multimedia (Mobile Learning)

Mobile Learning of Eutectic Phase Diagrams



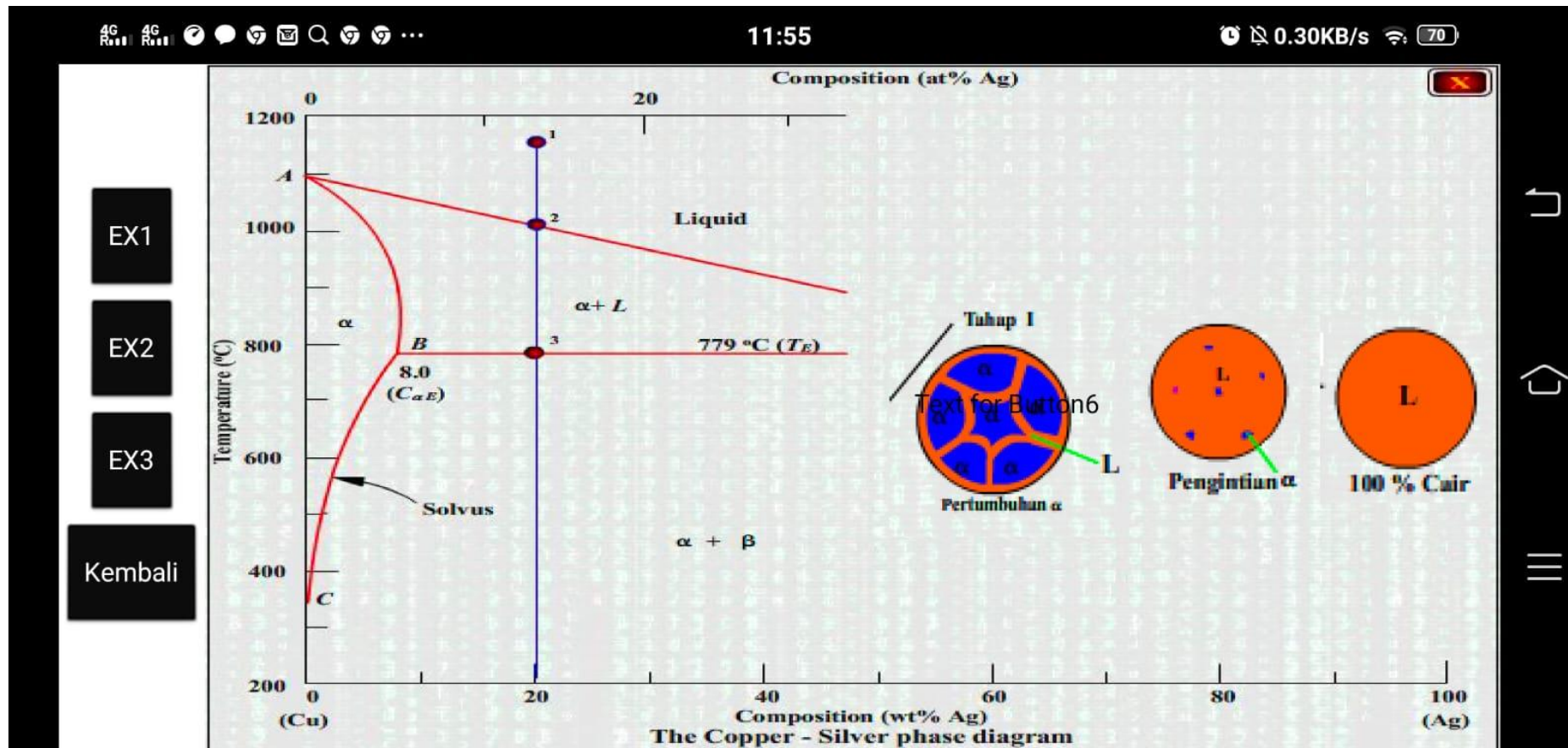
Example of Android Based Multimedia (Mobile Learning)

Mobile Learning of Eutectic Phase Diagrams



Example of Android Based Multimedia (Mobile Learning)

Mobile Learning of Eutectic Phase Diagrams



b. Certificate:

1. Intellectual property rights,
2. National Seminar,
3. International Seminar,

b. Certificate:

1. Intellectual property rights,

REPUBLIC INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

SURAT PENCATATAN CIPTAAN

Dalam rangka perlindungan ciptaan di bidang ilmu pengetahuan, seni dan sastra berdasarkan Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta, dengan ini menerangkan:

Nomor dan tanggal permohonan	: EC00202056049, 4 Desember 2020
Pencipta	
Nama	: Dr. Mumu Komaro, MT., Drs. H. Ariyano, MT. dkk
Alamat	: Jl. Fajar No 7. Komplek Kopo Elok, Kota Bandung , Bandung , JAWA BARAT, 40227
Kewarganegaraan	: Indonesia
Pemegang Hak Cipta	
Nama	: Dr. Mumu Komaro, MT., Drs. H. Ariyano, MT. dkk

b. Certificate:

1. Intellectual property rights,

No	Karya Ilmiah	Judul	Identitas
4	H K I	4.1 Program Komputer: Multimedia Elektroplating untuk Pembelajaran Pelapisan Logam. (Nomor Pencatatan: 079770)	Surat Pencatatan Ciptaan
		4.2 Karya Tulis: A Desain of Innovative Engineering Drawing Teaching Material. (Nomor Pencatatan: 000111529)	
		4.3 Program Komputer: E-Book Multimedia Animasi Gambar Teknik (E-MMAGT). (Nomor Pencatatan: 000111269)	
		4.4 Program Komputer: E-Book Multimedia Animasi Struktur Kristal Atom. (Nomor Pendaftaran: 068164)	
		4.5 Program Komputer: Software Pembelajaran Bidang Geser Atom E-Book Multimedia Animasi (MMA)	
No	Karya Ilmiah	Judul	
		4.15 Buku Panduan/Petunjuk: Kit Koko Berkelas "Kontrol Konsentrasi Belajar Kelas" Berbasis <i>Internet of Things</i> ". (Nomor pencatatan : 000204921)	
		4.16 Modul: Modul Berbasis Kompetensi Perangkat Pembelajaran (Silabus, Rpp, Evaluation Sheet, Job Sheet). (Nomor pencatatan : 000221054)	
		4.17 Buku Panduan: APLIKASI MOBILE LEARNING “belajarbubut”. (Nomor pencatatan : 000236241)	

b. Certificate: 2. National Seminar,

Seminar Nasional					
1.	M Komaro, A Djohar, A Setiawan, B Hasan, RA Hamdani, Y Sukrawan,	Multimedia Animasi (Mma) Dalam Meningkatkan Pemahaman Struktur Kristal Atom Penentu Sifat Mekanik Material	Prosiding Seminar Nasional PTK EXPO.	Bandung	Nopember 2013
2.	M Komaro , A Djohar , A Setiawan, B Hasan, S Hidayat	Animation Multimedia (MMA) Of Improving The Concept Mastery Of Atomic Crystal Structure That Determinants Mechanical Properties Of Material	Prosiding: 3 rd Internasional TVET Conference	Bandung	November. 2014.
3.	B. Darmawan, M. Komaro	Multimedia Animasi Pembelajaran Struktur Kristal Sel Satuan Based Centered Cubic (BCC) pada Prestasi Belajar Mahasiswa Pendidikan Teknik Mesin UPI	Prosiding Seminar Nasional PTK, SPs UPI	Bandung	September 2016
4.	M. Komaro, S. Handayani, A. Wardianto	Pemanfaatan Multimedia Animasi Pembelajaran Cacat Kristal Pada Prestasi Belajar Mahasiswa Calon Guru SMK	Prosiding Seminar Nasional PTK, SPs UPI	Bandung	September 2016
5.	B Darmawan, M Komaro,	Manfaat Multimedia Animasi Terhadap Peningkatan Pemecahan Masalah Materi Diagram Fasa Pada Mata Kuliah Material Teknik Ditinjau Dari Kelompok Unggul Dan Rendah	Prosiding: Seminar Nasioanal APTEKINDO, UNESA	Surabaya	Juli 2018
6.	M Komaro, Ariyano, A Suherman, A Hermansyah	Respon Mensiasati Susahnya Materi Hitungan Dengan Multimedia Animasi Pada Materi Diagram Fasa Mata Kuliah Material Teknik	Prosiding: Seminar Nasioanal APTEKINDO, UNESA	Surabaya	Juli 2018

b. Certificate:

3. International Seminar,



No	Karya Ilmiah	Judul	Identitas
2	Seminar Internasional		
	Seminar Internasional Terindeks SCOPUS	2.1 Reduction in power consumption of refrigerator by using parallel expansion. (Sebagai Anggota)	In IOP Conference Series: Materials Science and Engineering (Vol. 434, p. 012173); https://iopscience.iop.org/article/10.1088/1757-899X/434/1/012173/meta
	Seminar Internasional Terindeks SCOPUS	2.2 Development of Standard Operational Procedure (SOP) for the implementation of lath machining practice in Vocational High School (SMK). (Sebagai Anggota)	MS&E, 2018 MS&E, 434(1), 012298. - iopscience.iop.org; https://iopscience.iop.org/article/10.1088/1757-899X/434/1/012298
	Seminar Internasional	2.3 Expansion Parallel Liquid Refrigerant On A Vapor Compression Systems With	IOP Conference Series: Materials Science and

b. Certificate:

3. International Seminar,

Daftar Seminar Internasional (01)					
1.	M Komaro, RH Putra, and D Dermawan	Integrated Visualization, Chronological Simulation & Smart Analogy (iVCSA) as an Innovative E-Learning Model for Education in Science, Technology, Engineering & Mathematics (STEM) Field	Proceeding: 8 th International Symposium on Advance in Tech Education.	Nanyang Polytechnic, Singapore	September 2014.

Daftar Seminar Internasional (02)					
11.	Mumu Komaro, Ariyano, Amay Suherman, Gian F Giovani	Analysis of Multimedia Animation (MMA) Application on Material Science and Engineering (MSE) Learning in Higher Education	The 4th International Conference on Innovative Education and Technology (ICIET)	Thailand	Juli 2019
12.	Mujiarto, Djohar A., Komaro M., Muhammad, T., Sayuti M.	Application of Multimedia Animation Engineering Drawing (MMAED) for Vocational High School Students	Journal of Physics: Conference Series	IOP Publishing Ltd	Agustus 2019
13.	D Hafid, A Djohar, A G Abdullah and M Komaro	Work Based Learning In Vocational Education	Journal of Physics: Conference Series	IOP Publishing Ltd	Agustus 2019
14.	AAprinaldi, Y Rahmawati and M Komaro	Implementation of Augmented Reality (AR) android based in learning	Journal of Physics: Conference Series	IOP Publishing Ltd	Agustus 2019
15.	E T Berman, M Komaro, M Miftakhudin, M Mutaufiq and A Suherma	Enhancing performance of wall mounted split air conditioner using capillary tube in a tube heat exchanger	ICIEVE 2019 IOP Conf. Series: Materials Science and Engineering	IOP Publishing	Mei 2020
16.	D Hafid, A Djohar, A G Abdullah and M Komaro.	Work based learning in motorcycle classroom part 2	ICIEVE 2019 IOP Conf. Series: Materials Science and Engineering	IOP Publishing	Mei 2020
17.	I Yulianti, I Hamidah and M Komaro	Green Chemistry principle: Ionic Liquids as a material teaching for vocational students	ICIEVE 2019 IOP Conf. Series: Materials Science and Engineering	IOP Publishing	Mei 2020
18.	Mujiarto, A Djohar, M Komaro, ...	Implementation of Multimedia Animation Engineering Drawing (MMAED) for Vocational High School	Journal of Physics: Conference Series	IOP Publishing	Mei 2020

c. Article:

1. National Journal,
2. International Journal,
3. Scopus Indexed International Journal.

1. National Journal,

No	Karya Ilmiah	Judul	Identitas
	Jurnal Nasional Jurnal Nasional Terakreditasi DIKTI	1.10 Multimedia Animasi (MMA) Dalam Meningkatkan Penguasaan Konsep Bidang Geser Atom Penentu Sifat Mek	Edusentris, 2(2), 146-155. http://ejournal.sps.upi.edu/index.php/edusentris/article/
	Jurnal Nasional Terakreditasi DIKTI	1.11 Peng Hasi Perb Ang	
	Jurnal Nasional Terakreditasi DIKTI	1.12 Stud Mod Siste	
		No	Karya Ilmiah
		Judul	Identitas
		Jurnal Nasional Terakreditasi DIKTI	1.19 Penerapan Simulator Electric Mirror Untuk Meningkatkan Kompetensi Dasar Memahami Sistem Kelistrikan Pengaman Dan Kelengkapan Tambahan Pada Peserta Didik di SMKN. (Sebagai Anggota) Journal of Mechanical Engineering Education, 5(2), 185-190. https://ejournal.upi.edu/index.php/jmee/article/view/15186
		Jurnal Nasional Terakreditasi DIKTI	1.20 Perbandingan Hasil Belajar Multimedia Interaktif Model Tutorial dengan Media Handout pada Kompetensi Gambar Teknik. (Sebagai Anggota) Journal of Mechanical Engineering Education, 3(2), 241-246. https://ejournal.upi.edu/index.php/jmee/article/view/4557
		Jurnal Nasional Terakreditasi DIKTI	1.21 Penerapan Media Pembelajaran Engine Cutting Sepeda Motor Tipe Al 115 F/Fc Pada Kompetensi Memahami Cara Kerja Engine Empat Langkah di Journal of Mechanical Engineering Education, 5(2), 151-156. https://ejournal.upi.edu/index.php/jmee/article/view/4557

1. International Journal,

No	Karya Ilmiah	Judul	Identitas
	Internasional Online	to Overcome Difficulties in Isomorphous Binary Phase Diagram Learning Materials (Sebagai Ketua)	Advanced Science and Technology Vol. 29, No. 7s, (2020), pp. 284-289; http://sersc.org/journals/index.php/IJAST/article/view/9438
	Jurnal Internasional Online	1.7 Electrical Conductivity and Surface Roughness Properties of Ferroelectric Gallium Doped Ba 0,5 Sr 0,5 TiO 3 (BGST) Thin Films (Sebagai Anggota)	Indonesian Journal of Physics Vol 19 No. 4, October 2008; https://www.researchgate.net/publication/293958960_Electrical_Conductivity_and_Surface_Roughness_Properties_of_Ferroelectric_Gallium_Doped_Ba_05_Sr_05_TiO_3_BGST_Thin_Films

Jurnal
Internasional
Online

ah	Judul	Identitas
al	1.8 Optimizing Multimedia Animation on the Improvement of Problem Solving in Crystal Defects Material in Engineering Material Course in Terms of Upper and Lower Group. (Sebagai Anggota)	international Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV6IS010031 Vol. 6 Issue 01, January-2017 Optimizing Multimedia Animation on the Improvement of Problem Solving in Crystal Defects Material in Engineering Material Course in Terms of Upper and Lower Group – IJERT
	1.9 Design and Developement Multimedia Animation Corrosion and Coating Process. (Sebagai Anggota)	Innovation of Vocational Technology Education, 14(1), 37-43. https://ejournal.upi.edu/index.php/invotec/article/view/1

1. Scopus Indexed International Journal.

No	Karya Ilmiah	Judul	Identitas
1	Jurnal Internasional Jurnal Internasional Terindeks (Q2; SJR 2019: 0,24)	1.1 Design and Development of Animation Media for Isomorphous Binary Phase Diagram of Engineering Material Courses. (Sebagai Ketua)	Journal of Engineering Science and Technology Vol. 16, (2021) © School Engineering, Taylor's University;
	Jurnal Internasional Terindeks (Q2; SJR 2019: 0,24)	1.2 THE ELECTRICAL PROPERTIES OF NIOBIUM DIOXIDE THIN FILMS (Sebagai Anggota)	
	Jurnal Internasional Terindeks (Q2; SJR 2019: 0,24)	1.3 ANALYSIS OF INJECTION MOLDING TYPE 2 MOLD (Sebagai Ketua)	

No	Karya Ilmiah	Judul
	Jurnal Internasional Terindeks (Q3; SJR 2019: 0,21)	1.4 Colored object detection using robot arm based adaptive method (Sebagai Anggota)
	Jurnal Internasional Terindeks (Q3; SJR 2019: 0,33)	1.5 A SYNTHESIS OF BAKKITE FILM AND CHARACTERIZATION OF FERROELECTRIC PROPERTIES AND ITS EXTENSION ACCESS MEMORY (Sebagai Anggota)

No	Karya Ilmiah	Judul	Identitas
1	Jurnal Internasional Terindeks (Q3; SJR 2020: 0.24)	1.1 DEVELOPMENT OF ANDROID-BASED MULTIMEDIA APPLICATION TO OVERCOME THE DIFFICULTY OF PROBLEM-SOLVING IN THE FE-C PHASE DIAGRAM SUBJECT. (Sebagai Ketua)	Journal of Engineering Science and Technology, 16(5) (2021), 4149-4159, © School of Engineering, Taylor's University; https://jestec.taylors.edu.my/Vol%2016%20Issue%205%20October%202021/16_5_36.pdf
	Jurnal Internasional Terindeks (Q3; SJR 2020: 0.24)	1.2 COMPARISONAL ANALYSIS MECHANICAL PROPERTIES OF MATERIAL MIXER BLADE AISI 1522 CARBON STEEL AND WHITE CAST IRON DUE TO HARDENING PROCESS. (Sebagai Anggota)	
	Jurnal Internasional	1.3 WORK-BASED LEARNING IN AUTOMOTIVE CLASSROOM.	

Reference

- Komaro, M., Minghat, A. D., Putra, R. H., Suherman, A., & Ana, A. M. (2022). Development of Android-based Multimedia to Improve Student Learning Outcome in Crystal Structure Subject of Engineering Materials Course. *Journal of Engineering Education Transformations*, 35(Special Issue 2).
- Utami, N., Setiawan, A., Hamidah, I. (2022). A Bibliometric Analysis Augmented Reality for Higher Education. *Eureca International Conference*, to be published on *Journal Science and Technology*.
- KOMARO, M., SUHERMAN, A., ARIFN, M. F. T., PUTRA, R. H., DARMAWAN, B., ANA, A., & MUKTIARNI, M. (2021). DEVELOPMENT OF ANDROID-BASED MULTIMEDIA APPLICATION TO OVERCOME THE DIFFICULTY OF PROBLEM-SOLVING IN THE FE-C PHASE DIAGRAM SUBJECT. *Journal of Engineering Science and Technology*, 16(5), 4149-4159.
- KOMARO, M., ARIYANO, A. S., ANA, A., & PANGESTU, R. (2021). DESIGN AND DEVELOPMENT OF ANIMATION MEDIA FOR ISOMORPHOUS BINARY PHASE DIAGRAM OF ENGINEERING MATERIAL COURSES. *Journal of Engineering Science and Technology*, 16(1), 778-791.
- Komaro, M., Ariyano, A., Suherman, A., & Herdiansyah, A. (2019, February). Benefits of Using Animation Multimedia to Improve Students Ability in Mastering Phase Diagram Material of Engineering Subject between Higher and Lower Group Achievement. In *5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018)* (pp. 223-225). Atlantis Press.

Reference (02)

- Komaro, M., Ariyano, A., Suherman, A., & Herdiansyah, A. (2019, February). Benefits of Using Animation Multimedia to Improve Students Ability in Mastering Phase Diagram Material of Engineering Subject between Higher and Lower Group Achievement. In *5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018)* (pp. 223-225). Atlantis Press.
- Komaro, M., Ariyano, A., Suherman, A., & Geovani, G. F. (2018). Problem solving in phase diagram of engineering material subject through animation as learning media. In *MATEC Web of Conferences* (Vol. 197, p. 12008). EDP Sciences.
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Alhamdulillah,

Thank you very much

Jazaakumullaahu khoir,