

**KARAKTERISASI KETERAMPILAN *COLLABORATIVE PROBLEM
SOLVING (CPS)* PESERTA DIDIK SMK MELALUI
PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS**

Tesis

diajukan untuk memenuhi sebagian syarat untuk memperoleh
gelar Magister Pendidikan Fisika



Oleh

**AZURA
NIM.1806335**

**PROGRAM STUDI PENDIDIKAN FISIKA
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
2020**

KARAKTERISASI KETERAMPILAN *COLLABORATIVE PROBLEM SOLVING* (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS

Oleh

Azura

Sebuah Tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Pendidikan (M.Pd) pada Program Studi Pendidikan Fisika

©Azura 2020

Universitas Pendidikan Indonesia

Juli 2020

Hak Cipta dilindungi undang-undang.

Tesis ini tidak boleh diperbanyak seluruhnya atau sebagian, dengan dicetak ulang, difotokopi, atau cara lainnya tanpa izin dari penulis.

Azura, 2020

KARAKTERISASI KETERAMPILAN *COLLABORATIVE PROBLEM SOLVING* (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Halaman Pengesahan Tesis

AZURA

KARAKTERISASI KETERAMPILAN *COLLABORATIVE PROBLEM SOLVING* (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS

disetujui dan disahkan oleh pembimbing:

Pembimbing I



**Irma Rahma Suwarma, M.Pd., Ph.D
NIP. 198105032008012015**

Pembimbing II



**Dr. Ridwan Efendi, M.Pd
NIP. 19770110200801001**

Mengetahui,
Ketua Program Studi Pendidikan Fisika



**Dr. Taufik Ramelan Ramalis, M.Si
NIP. 195904011986011001**

KARAKTERISASI KETERAMPILAN COLLABORATIVE PROBLEM SOLVING (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS.

Azura

ABSTRAK

Proses penilaian keterampilan *Collaborative Problem Solving* (CPS) khususnya di Indonesia masih jarang ditemukan. Studi ini menggunakan metode online untuk menggali karakteristik keterampilan CPS peserta didik melalui penilaian berbasis web interaktif pada laman webcps.site. Peserta didik bekerja secara berpasangan menyelesaikan dua *task* tentang materi listrik dinamis. Metode yang digunakan dalam penelitian ini adalah metode *survey*. Data aliran proses diambil dari 15 grup yang dikelompokkan secara acak dari 30 peserta didik (17 diantaranya peserta didik laki-laki dan 13 peserta didik perempuan) di salah satu Sekolah Menengah Kejuruan Pulau Bengkalis di provinsi Riau. Data ditransformasikan menjadi indikator keterampilan *Collaborative Problem Solving* berdasarkan kata kunci dengan bantuan *software Nvivo 12 Plus*, kemudian dikategorikan berdasarkan empat level yaitu *Beginner* (level 1), *Emerging* (level 2), *intermediate* (level 3), dan *advance* (level 4). Hasil penelitian menunjukkan bahwa siswa berada di berbagai level dengan karakteristik yang berbeda di kedua domain sosial dan domain kognitif dalam keterampilan CPS. Penilaian yang digunakan dalam penelitian ini dapat digunakan sebagai instrumen pengukuran keterampilan pemecahan masalah kolaboratif.

Kata Kunci: *Collaborative Problem Solving*, Penilaian berbasis WEB, Sekolah Menengah Kejuruan

Azura, 2020

KARAKTERISASI KETERAMPILAN COLLABORATIVE PROBLEM SOLVING (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

**CHARACTERIZATION OF COLLABORATIVE PROBLEM SOLVING (CPS)
SKILLS OF VOCATIONAL HIGH SCHOOL STUDENTS THROUGH
WEB-BASED ASSESSMENT IN DYNAMIC ELECTRICITY**

Azura

ABSTRACT

The process of assessing Collaborative Problem Solving (CPS) skills, especially in Indonesia, is still rare. This study uses an online method to explore the characteristics of students' CPS skills through interactive web-based assessments on the webcps.site page. Students work in pairs to complete two tasks about dynamic electrical material. The method used in this research is a survey method. Process flow data were taken from 15 groups randomly grouped from 30 students (17 of whom were male students and 13 were female students) in one of the Bengkalis Island Vocational High Schools in Riau province. The data is transformed into indicators of Collaborative Problem Solving skills based on keywords with the help of Nvivo 12 Plus software, then categorized based on four levels, namely Beginner (level 1), Emerging (level 2), intermediate (level 3), and advanced (level 4). The results showed that students were at various levels with different characteristics in both the social domain and the cognitive domain in CPS skills. The assessment used in this study can be used as an instrument for measuring collaborative problem solving skills.

Keywords: Collaborative Problem Solving, WEB-based Assessment, Vocational High School

DAFTAR ISI

	Halaman
HALAMAN HAK CIPTA	ii
HALAMAN PENGESAHAN	iii
PERNYATAAN	Error! Bookmark not defined.
UCAPAN TERIMA KASIH.....	Error! Bookmark not defined.
ABSTRAK.....	iv
ABSTRACT.....	v
DAFTAR ISI	vi
DAFTAR TABEL	ix
DAFTAR GAMBAR.....	x
DAFTAR LAMPIRAN	xii
BAB I PENDAHULUAN	Error! Bookmark not defined.
1.1. Latar Belakang Penelitian	Error! Bookmark not defined.
1.2. Rumusan Masalah Penelitian	Error! Bookmark not defined.
1.3. Tujuan Penelitian	Error! Bookmark not defined.
1.4. Manfaat Penelitian	Error! Bookmark not defined.
1.5. Definisi Operasional	Error! Bookmark not defined.
BAB II COLLABORATIVE PROBLEM SOLVING SKILLS (CPSS) DAN PENILAIANNYA	Error! Bookmark not defined.
2.1. <i>Collaborative Problem Solving Skill (CPSS)</i>	Error! Bookmark not defined.
2.1.1. <i>Definisi Collaborative Problem Solving Skill (CPSS)</i>	Error! Bookmark not defined.
2.1.2. <i>Domain Collaborative Problem Solving Skill (CPSS)</i>	Error! Bookmark not defined.
2.1.3. Perancangan Tugas <i>Collaborative Problem Solving Skill (CPSS)</i>	Error! Bookmark not defined.
2.1.4. Pendekatan Penilaian <i>Collaborative Problem Solving Skill (CPSS)</i>	Error! Bookmark not defined.
2.1.5. Penilaian <i>Collaborative Problem Solving Skill (CPSS)</i> berbasis WEB	Error! Bookmark not defined.
2.2. Listrik Dinamis	Error! Bookmark not defined.

- 2.2.1. Arus Listrik **Error! Bookmark not defined.**
- 2.2.2. Hukum Ohm..... **Error! Bookmark not defined.**
- 2.2.3. Rangkaian Seri dan Paralel **Error! Bookmark not defined.**
- 2.2.4. Kasus-kasus Masalah Listrik dinamis . **Error! Bookmark not defined.**
- 2.3. Penelitian yang Relevan..... **Error! Bookmark not defined.**
- 2.4. Kerangka Pikir Penelitian **Error! Bookmark not defined.**
- BAB III METODE PENELITIAN** **Error! Bookmark not defined.**
- 3.1. Metode dan Desain Penelitian..... **Error! Bookmark not defined.**
- 3.2. Partisipan..... **Error! Bookmark not defined.**
- 3.3. Instrumen Penelitian **Error! Bookmark not defined.**
- 3.3.1. Webcps Collaborative Problem Solving (CPS) .. **Error! Bookmark not defined.**
- 3.3.2. File log webcps **Error! Bookmark not defined.**
- 3.4. Teknik Analisis Data **Error! Bookmark not defined.**
- 3.4.1. Webcps *Collaborative Problem Solving Skill (CPSS)*..... **Error! Bookmark not defined.**
- 3.4.2. File Log Webcps **Error! Bookmark not defined.**
- BAB IV TEMUAN DAN PEMBAHASAN** **Error! Bookmark not defined.**
- 4.1. Karakteristik Level Keterampilan *Collaborative Problem Solving* Peserta Didik ditinjau dari Domain CPS. **Error! Bookmark not defined.**
- 4.2. Karakteristik level Keterampilan CPS Peserta Didik ditinjau pada sub-Domain Sosial **Error! Bookmark not defined.**
- 4.2.1. Frekuensi Keterampilan CPS pada Domain Sosial. ..**Error! Bookmark not defined.**
- 4.2.2. Keterampilan CPS Sub-domain *Participation* .. **Error! Bookmark not defined.**
- 4.2.3. Keterampilan CPS Sub-domain *Perspective Taking* .**Error! Bookmark not defined.**
- 4.2.4. Keterampilan CPS Sub-domain *Social Regulation* ...**Error! Bookmark not defined.**
- 4.2.5. Perbandingan Keterampilan Sub-domain Sosial Peserta Didik pada Setiap Task **Error! Bookmark not defined.**
- 4.3. Karakteristik Keterampilan CPS Peserta Didik ditinjau pada Sub-domain Kognitif..... **Error! Bookmark not defined.**

- 4.3.1. Frekuensi Keterampilan Domain Kognitif..... **Error! Bookmark not defined.**
- 4.3.2. Keterampilan CPS Sub-domain *Task Regulation***Error! Bookmark not defined.**
- 4.3.3. Keterampilan CPS Sub-domain *Knowledge Building***Error! Bookmark not defined.**
- 4.3.4. Perbandingan Keterampilan CPS Domain kognitif Peserta Didik pada Setiap *Task***Error! Bookmark not defined.**
- 4.4. Generalisasi Karakteristik Keterampilan CPS Peserta Didik**Error! Bookmark not defined.**
- 4.5. Analisis Kekurangan dan Kelebihan Penilaian CPS berbasis WEB ... **Error! Bookmark not defined.**

BAB V SIMPULAN, IMPLIKASI DAN REKOMENDASI.**Error! Bookmark not defined.**

- 5.1. Simpulan **Error! Bookmark not defined.**
 - 5.2. Implikasi..... **Error! Bookmark not defined.**
 - 5.3. Rekomendasi **Error! Bookmark not defined.**
- DAFTAR PUSTAKA** **Error! Bookmark not defined.**
- LAMPIRAN** **Error! Bookmark not defined.**

DAFTAR TABEL

Halaman

Tabel 2.1 Keterampilan CPS Domain Sosial (Hesse et al, 2015) **Error! Bookmark not defined.**

Tabel 2.2 Keterampilan CPS Domain kognitif (Hesse et al, 2015)**Error! Bookmark not defined.**

Tabel 3.1 Level Keterampilan CPS Domain Sosial (I R Suwarma & I I Krisna 2019)
Error! Bookmark not defined.

Tabel 3.2 Level Keterampilan CPS Domain Kognitif (I R Suwarma & I I Krisna 2019).....**Error! Bookmark not defined.**

Tabel 3.3 Kata Kunci Domain CPS (I R Suwarma & I I Krisna 2019)**Error! Bookmark not defined.**

Tabel 4.1 Level Keterampilan CPS Peserta Didik**Error! Bookmark not defined.**

Tabel 4.2 Frekuensi Keterampilan CPS Domain Sosial. **Error! Bookmark not defined.**

Tabel 4.3 Analisis File Log Keterampilan Sub-domain Participation .**Error! Bookmark not defined.**

Azura, 2020

KARAKTERISASI KETERAMPILAN COLLABORATIVE PROBLEM SOLVING (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- Tabel 4.4 Analisis File Log Keterampilan Sub-domain Perspective Taking Task
1 **Error! Bookmark not defined.**
- Tabel 4.5 Analisis File Log Keterampilan Sub-domain Perspective Taking Task
2 **Error! Bookmark not defined.**
- Tabel 4.6 Analisis File Log Keterampilan Sub-domain Social Regulation Task 1 **Error!**
Bookmark not defined.
- Tabel 4.7 Analisis File Log Keterampilan Sub-domain Sosial Regulation Task 2. **Error!**
Bookmark not defined.
- Tabel 4.8 Frekuensi Keterampilan CPS Domain Kognitif **Error! Bookmark not**
defined.
- Tabel 4.9 Analisis File Log Keterampilan Sub-domain Task Regulation Task 1 .. **Error!**
Bookmark not defined.
- Tabel 4.10 Analisis File Log Keterampilan Sub-domain Task Regulation Task 2. **Error!**
Bookmark not defined.
- Tabel 4.11 Analisis File Log Keterampilan CPS Sub-domain Knowledge Building Task
1 **Error! Bookmark not defined.**
- Tabel 4.12 Analisis File Log Keterampilan CPS Sub-domain Knowledge Building Task
2 **Error! Bookmark not defined.**

DAFTAR GAMBAR

Halaman

- Gambar 2.1 Domain *Collaborative Problem Solving Skills* (Hesse et al, 2015) **Error! Bookmark not defined.**
- Gambar 2.2 Langkah-langkah Merancang Tugas atau Proyek CPS (Modifikasi dari Griffin, 2014)..... **Error! Bookmark not defined.**
- Gambar 2.3 *Framework* Program Webcps..... **Error! Bookmark not defined.**
- Gambar 2.4 (a) Rangkaian listrik sederhana. (b) Gambar skematik dari sirkuit yang sama, terdiri dari baterai, menghubungkan kabel (garis abu-abu tebal), dan bola lampu atau perangkat lain. (Sumber: Giancoli, 2014) . **Error! Bookmark not defined.**
- Gambar 2.5 Grafik Arus terhadap tegangan (a) untuk konduktor logam yang mematuhi hukum Ohm perangkat ohmik, dan (b) untuk perangkat non ohmik (sumber: Giancoli, 2014) **Error! Bookmark not defined.**
- Gambar 2.6 (a) Resistansi terhubung secara seri. (b) Resistansi bisa berupa bola lampu, atau jenis lainnya. (c) Resistansi tunggal ekivalen yang menarik arus yang sama: $Req = R1 + R2 + R3$ (sumber: Giancoli, 2014) **Error! Bookmark not defined.**
- Gambar 2.7 (a) Resistansi terhubung secara paralel. (b) Resistansi bisa berupa bola lampu. (c) Rangkaian ekivalen dengan diperoleh $1Req = 1R1 + 1R2 + 1R3$ (sumber: Giancoli, 2014) **Error! Bookmark not defined.**
- Gambar 2.8 Kerangka Berpikir Penelitian **Error! Bookmark not defined.**
- Gambar 3.1 Prosedur Penelitian *Survey*..... **Error! Bookmark not defined.**
- Gambar 3.2 Peta Pulau Bengkalis (sumber: *Google Maps*). **Error! Bookmark not defined.**
- Gambar 3.3 *Task 1* dan *Task 2* pada Penilaian webcps.site . **Error! Bookmark not defined.**
- Gambar 4.1 Frekuensi Keterampilan CPS Domain Sosial pada *Task 1* **Error! Bookmark not defined.**
- Gambar 4.2 Frekuensi Keterampilan CPS Domain Sosial pada *Task 2* **Error! Bookmark not defined.**
- Gambar 4.3. Persentase Level keterampilan Sub-domain *Participation* **Error! Bookmark not defined.**

- Gambar 4.4. Persentase Level Keterampilan Sub-domain *Perspective Taking*..... **Error! Bookmark not defined.**
- Gambar 4.5 *Word Cloud* Keterampilan Sub-Domain *Perspective Taking* **Error!**
Bookmark not defined.
- Gambar 4.6. Persentase Level Keterampilan Sub-domain *Social Regulation***Error!**
Bookmark not defined.
- Gambar 4.7 *Word Cloud* Keterampilan Sub-domain *Social Regulation* **Error!**
Bookmark not defined.
- Gambar 4.8 Diagram Perbandingan (*Comparison Diagram*) Keterampilan CPS Domain Sosial *Task 1* dan *Task 2*; (a) *participation*, (b) *perspective taking*, dan (c) *social regulation*. **Error! Bookmark not defined.**
- Gambar 4.9 Frekuensi Keterampilan CPS Domain Kognitif pada *Task 1*.... **Error!**
Bookmark not defined.
- Gambar 4.10 Frekuensi Keterampilan CPS Domain Kognitif pada *Task 2*... **Error!**
Bookmark not defined.
- Gambar 4.11 Persentase Level Keterampilan CPS Sub-domain *Task Regulation* **Error! Bookmark not defined.**
- Gambar 4.12 *Word Cloud* Keterampilan CPS sub-domain *Task Regulation* **Error!**
Bookmark not defined.
- Gambar 4.13 Persentase Level Keterampilan CPS Sub-domain *Knowledge Building* **Error! Bookmark not defined.**
- Gambar 4.14 *Word Cloud* Keterampilan CPS Sub-domain *Knowledge Building* **Error! Bookmark not defined.**

DAFTAR LAMPIRAN

	Halaman
Lampiran A.1 Pedoman Wawancara	87
Lampiran A.2 Data Wawancara	89
Lampiran B.1 Tampilan Program Webcps pada Laman webcps.site	101
Lampiran C.1 Analisis File Log Keterampilan CPS Sub-domain <i>Participation</i>	106
Lampiran C.3 Analisis File Log Keterampilan CPS Sub-domain <i>Perspective Taking</i> ..	107
Lampiran C.3 Analisis File Log Keterampilan CPS Sub-domain <i>Social Regulation</i> ..	116
Lampiran C.4 Analisis File Log Keterampilan CPS Sub-domain <i>Task Regulation</i>	126
Lampiran C.5 Analisis File Log Keterampilan CPS Sub-domain <i>Knowledge Building</i>	136
Lampiran D.1 Surat Keterangan Melaksanakan Penelitian	143

DAFTAR PUSTAKA

- Adejumo, G., Duimering, P. R., & Zhong, Z. (2008). A balance theory approach to group problem solving. *Social Networks*, 30(1), 83–99.
<https://doi.org/10.1016/j.socnet.2007.09.001>
- Ahonen, A. K., & Harding, S. (2018). *Assessing Online Collaborative Problem Solving Among School Children in Assessing Online Collaborative Problem Solving Among School Children in Finland : A Case Study Using ATC21S TM in a National Context*. February. <https://doi.org/10.26803/ijlter.17.2.9>
- Alterman, R., & Harsch, K. (2017). A more reflective form of joint problem solving. *International Journal of Computer-Supported Collaborative Learning*, 12(1), 9–33. <https://doi.org/10.1007/s11412-017-9250-1>
- Andrews-todd, J. (2019). *Collaborative Problem Solving Assessment in an Online Mathematics Task*. May. <https://doi.org/10.1002/ets.212260>
- Avouris, N., Dimitracopoulou, A., & Komis, V. (2003). On analysis of collaborative problem solving: An object-oriented approach. *Computers in Human Behaviour*, 19(2), 147–167.
- Barron, B. (2003). Journal of the Learning When Smart Groups Fail When Smart Groups Fail. *The Journal of the Learning Sciences*, 12(November 2011), 307–359. <https://doi.org/10.1207/S15327809JLS1203>
- Binkley, M., Erstad, O., Herman, J., Raizen, S., & Ripley, M. (2010). *NOT for quotation in this draft form i Draft White Paper 1 Defining 21st century skills*. January.
- Biswas, G., Jeong, H., Kinnebrew, J., Sulcer, B., & Roscoe, R. (2010). Measuring self-regulated learning skills through social interactions in a teachable agent environment. *Research and Practice in Technology-Enhanced Learning*, 5, 123–152. doi:10.1142/S1793206810000839
- Cai, Z., Graesser, A. C., Forsyth, C., Burkett, C., Millis, K., Wallace, P., Halpern, D., & Butler, H. (2011). Trialog in ARIES: User input assessment in an intelligent tutoring system. In W. Chen & S. Li (Eds.), *Proceedings of the 3rd IEEE International Conference on Intelligent Computing and Intelligent Systems* (pp. 429–433). Guangzhou: IEEE Press.
- Care, E., Griffin, P., Scoular, C., Awwal, N., & Zoanetti, N. (2015). Collaborative problem solving tasks. In P. Griffin & E. Care (Eds.), *Assessment and teaching of 21st century skills: Methods and approach* (pp. 85–104). Dordrecht: Springer
- Chang, C J, Chang, M H, Liu, C C, et al., (2017). An analysis of collaborative problem-solving activities mediated by individual-based and collaborative computer simulations, *Journal of Computer Assisted Learning*.

- Chen, G., Donahue, L. M., & Klimoski, R. J. (2004). Training undergraduates to work in organizational teams. *Academy of Management Learning and Education*, 3, 27–40.
- Conradie, E.S. (2004). *The Role of Key Players in Science Communication at South African Higher Education Institution: An Exploratory Study*. Dissertation. University of Pretoria
- Cooke, N. J., Kiekel, P. A., Salas, E., Stout, R., Bowers, C., & Cannon-Bowers, J. (2003). Measuring team knowledge: A window to the cognitive underpinnings of team performance. *Group Dynamics: Theory, Research and Practice*, 7(3), 179–219.
- Creswell, J. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 4th Edition. California: SAGE Publication, Inc.
- Dehler Zufferey, J., Bodemer, D., Buder, J., & Hesse, F. W. (2011). Partner knowledge awareness in knowledge communication: Learning by adapting to the partner. *Journal of Experimental Education*, 79(1), 102–125.
<https://doi.org/10.1080/00220970903292991>
- Dillenbourg, P., Lemaignan, S., Sangin, M., Nova, N., & Molinari, G. (2016). The symmetry of partner modelling. *International Journal of Computer-Supported Collaborative Learning*, 11(2), 227–253.
<https://doi.org/10.1007/s11412-016-9235-5>
- Ellis, A. P., Bell, B. S., Ployhart, R. E., Hollenbeck, J. R., & Ilgen, D. R. (2005). An evaluation of generic teamwork skills training with action teams: Effects on cognitive and skill-based outcomes. *Personnel Psychology*, 58, 641–672.
- Fischer, U., McDonnell, L., & Orasanu, J. (2007). Linguistic correlates of team performance: Toward a tool for monitoring team functioning during space missions. *Aviation, Space, and Environmental Medicine*, 78(5 Suppl.), B86–B95
- Foltz, P. W., & Martin, M. J. (2008). *Automated communication analysis of teams*. In E. Salas, G. F. Goodwin & S. Burke (Eds.), *Team effectiveness in complex organizations and systems: Cross-disciplinary perspectives and approaches* (pp. 411–431). New York: Routledge.
- Fraenkel, Jack. R., and Norman E. Wallen. (2012). *How to Design and Evaluate Research in Education* 8th Edition. Boston: McGraw-Hill Higher Education.
- Giancoli D C. (2014). *Physics Principles with Applications* (Seventh Edition) New York: Pearson.
- Goffman, E. (1964). Situation The Neglected. *American Anthropologist*, 66(6), 133–136. https://doi.org/10.1525/aa.1964.66.suppl_3.02a00090
- Graesser, A. C., Fiore, S. M., Greiff, S., Andrews-Todd, J., Foltz, P. W., & Hesse, F. W. (2018). Advancing the Science of Collaborative Problem Solving.

Psychological Science in the Public Interest.
<https://doi.org/10.1177/1529100618808244>

Graesser, A., Kuo, B., & Liao, C. (2017). *Complex Problem Solving in Assessments of Collaborative Problem Solving*.
<https://doi.org/10.3390/jintelligence5020010>

Graesser, A. C., Jeon, M., & Dufty, D. (2008). Agent technologies designed to facilitate interactive knowledge construction. *Discourse Processes*, 45(4), 298–322

Graesser, A. C., Lu, S., Jackson, G. T., Mitchell, H., Ventura, M., Olney, A., & Louwerse, M. M. (2004). AutoTutor: A tutor with dialogue in natural language. *Behavior research methods, instruments, and computers*, 36, 180–193. doi:10.3758/BF03195563

Graesser, A. C., Conley, M. W., & Olney, A. M. (2012). *Intelligent tutoring systems*. In S. Graham, & K. Harris (Eds.), APA educational psychology handbook: Vol. 3. Applications to learning and teaching (pp. 451–473). Washington, DC: American Psychological Association.

Greene, R. W. dkk. (2004) Effectiveness of Collaborative Problem Solving in affectively dysregulated youth with oppositional defiant disorder: Initial findings. *Journal of Consulting and Clinical Psychology*, 72, 1157–1164

Griffin, P., Care, E., & Harding, S. (2015). Task characteristics and calibration. In P. Griffin & E. Care (Eds.), *Assessment and teaching of 21st century skills: Methods and approach* (pp. 113–178). Dordrecht: Springer.

Griffin, P., McGaw, B. & Care, E. (2012). *Assessment and teaching 21st century skills*. Heidelberg: Springer.

Griffin, P., & Care, E. (2015). *Assessment and teaching of 21st century skills: Methods and approach*. Dordrecht: Springer.

Gu, X., Chen, S., Zhu, W., & Lin, L. (2015). An intervention framework designed to develop the collaborative problem-solving skills of primary school students. *Educational Technology Research and Development*, 63(1), 143–159. <https://doi.org/10.1007/s11423-014-9365-2>

Harding, S. E., Griffin, P. E., Awwal, N., & Scoular, C. (2017). *Measuring Collaborative Problem Solving Using Mathematics-Based Tasks*. 3(3), 1–19. <https://doi.org/10.1177/2332858417728046>

Hesse, F., Care, E., Buder, J., Sassenberg, K., & Griffin, P. (2015). *A Framework for Teachable Collaborative Problem Solving Skills*. 37–57. <https://doi.org/10.1007/978-94-017-9395-7>

Horton, W. S., & Keysar, B. (1996). When do speakers take into account common ground? *Cognition*, 59(1), 91–117. [https://doi.org/10.1016/0010-0277\(96\)81418-1](https://doi.org/10.1016/0010-0277(96)81418-1)

- Hymes, D. (1929). *Introduction : Toward ethnographies of communication.* American Anthropologist, 1– 34.
- Järvelä, S., & Hadwin, A. F. (2013). New Frontiers: Regulating Learning in CSCL. *Educational Psychologist*, 48(1), 25–39. <https://doi.org/10.1080/00461520.2012.748006>
- Kim, M., & Tan, H. T. (2013). A Collaborative Problem-solving Process Through Environmental Field Studies. *International Journal of Science Education*, 35(3), 357–387. <https://doi.org/10.1080/09500693.2012.752116>
- Kivunja, C. (2015). *Exploring the Pedagogical Meaning and Implications of the 4Cs “Super Skills” for the 21 st Century through Bruner’s 5E Lenses of Knowledge Construction to Improve Pedagogies of the New Learning Paradigm.* February. <https://doi.org/10.4236/ce.2015.62021>
- Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C. S., Lyons, R., & Goodwin, G. F. (2009). Does team building work? *Small Group Research*, 40, 181–222.
- Koedinger, K. R. & Corbett, A. T. (2006). *Cognitive Tutors: Technology bringing learning science to the classroom.* In K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 61–78). Cambridge, MA: Cambridge University Press.
- Kuo, B., Liao, C., Pai, K., Shih, S., Mo, M., & Mok, C. (2019). Computer-based collaborative problem-solving assessment in Taiwan. *Educational Psychology*, 0(0), 1–22. <https://doi.org/10.1080/01443410.2018.1549317>
- Lai, E. R., DiCerbo, K. E., & Foltz, P. (2017). Skills for today: What we know about teaching and assessing collaboration. Retrieved from http://www.p21.org/storage/documents/_Skills_For_Today_Series-Pearson/Collaboration_White_Paper_FINAL.pdf
- Lunderbarg, V J. (2016). *Pedagogical Implementation of 21st Century Skills.*
- Matsuda, N., Cohen, W. W., Koedinger, K. R., Stylianides, G., Keiser, V., & Raizada, R. (2010). Turning cognitive tutors into a platform for learning-by-teaching with SimStudent technology. In D. Perez-Marín, I. Pascual-Nieto & S. Bull (Eds.), *Proceedings of the International Workshop on Adaptation and Personalization in E-B/Learning using Pedagogic* (pp. 20–25). Hawaii: Conversational Agents (APLeC)
- Mccroskey, J. C., & Mccroskey, L. L. (1985). *James C. McCroskey West Virginia University Linda L. McCroskey Arizona State University.*
- Millis, K., Forsyth, C., Butler, H., Wallace, P., Graesser, A. C., & Halpern, D. (2011). *Operation ARIES! A serious game for teaching scientific inquiry.* In M. Ma, A. Oikonomou, & J. Lakhmi (Eds.), *Serious games and edutainment applications* (pp. 169–196). London: Springer-Verlag.
- Mislevy, R. J., Steinberg, L. S., & Almond, R. G. (2003). On the structure of Azura, 2020
KARAKTERISASI KETERAMPILAN COLLABORATIVE PROBLEM SOLVING (CPS) PESERTA DIDIK SMK MELALUI PENILAIAN BERBASIS WEB PADA MATERI LISTRIK DINAMIS
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- educational assessments. Measurement: *Interdisciplinary Research and Perspectives*, 1, 3–62.
- National Research Council (2011). *Assessing 21st century skills*. Washington, DC: National Academies Press.
- National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Committee on a Conceptual Framework for New K-12 Science Education Standards*. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- National Science Teachers Association in Collaboration with the Association for the Education of Teachers in Science. (2003). *Standards for science Teacher Preparation*, [online] diakses dari <http://www.nsta.org/pdfs/NCATE-NSTAStandards2003.pdf>.
- Nye, B D., Graesser, A. C., & Hu, X. (2014). AutoTutor and family: A review of 17 years of natural language tutoring. *International Journal of Artificial Intelligence in Education*, 24(4), 427–469. doi:10.1007/s40593-014-0029-5
- Organisation for Economic Co-operation and Development (2013). *Draft collaborative problem solving framework*. Unpublished manuscript, OECD.
- Organisation for Economic Co-operation and Development. (2017a). *PISA 2015 assessment and analytical framework: Science, reading, mathematic, financial literacy and collaborative problem solving* (Rev. ed.), Retrieved from the OECD website: <http://dx.doi.org/10.1787/9789264281820en>
- Organisation for Economic Co-operation and Development. (2017b). *PISA 2015 results (volume V): Collaborative problem solving*. doi:10.1787/9789264285521-en
- O’Neil, H. F., Chung, G., & Brown, R. (1997). *Use of networked simulations as a context to measure team competencies*. In H. F. O’Neil, Jr. (Ed.), *Workforce readiness: Competencies and assessment* (pp. 411–452). Mahwah, NJ: Lawrence Erlbaum Associates.
- O’Neil, H. F., Chuang, S. H., & Chung, G. K. W. K. (2003). Issues in the computer-based assessment of collaborative problem solving. *Assessment in Education: Principles, Policy and Practice*, 10(3), 361–373. <https://doi.org/10.1080/0969594032000148190>
- O’Neil, H. F., Jr., & Chuang, S. H. (2008). *Measuring collaborative problem solving in low-stakes tests*. In E. L. Baker, J. Dickieson, W. Wulfeck & H. F. O’Neil (Eds.), *Assessment of problem solving using simulations* (pp. 177–199). Mahwah, NJ: Lawrence Erlbaum Associates.
- O’Neil, H. (2014). *Measurement of Collaborative problem Solving*. NAEP Innovations Symposium, Sept. 29, 2014, Alexandria, VA.

- Permendikbud Republik Indonesia Nomor 69 (2013). Tentang Kerangka Dasar dan Struktur Kurikulum Sekolah Menengah Atas/Madrasah Aliyah.
- Pöysä-Tarhonen, J., Care, E., Awwal, N., & Häkkinen, P. (2018). Pair interactions in online assessments of collaborative problem solving: case-based portraits. *Research and Practice in Technology Enhanced Learning*, 13(1). <https://doi.org/10.1186/s41039-018-0079-7>
- Reiss, M. J. (2018). *Raising attainment in post-compulsory physics through collaborative problem solving*. January.
- Robert J. Mislevy, Linda S. Steinberg, & Russell G. Almond. (1970). Measurement: Interdisciplinary Research and Perspectives. *Erdoel Kohle-Erdgas-Petrochem Ver Mit Brennst-Chem*, 23(10), 641–644. <https://doi.org/10.1207/S15366359MEA0101>
- Rosen, Y., & Rimor, R. (2012). *Teaching and assessing problem solving in online collaborative environment*. In R. Hartshorne, T. Heafner & T. Petty (Eds.), Teacher education programs and online learning tools: Innovations in teacher preparation (pp. 82–97). Hershey, PA: Information Science Reference, IGI Global
- Rosen, Y. (2014). *Learning and Assessing Collaborative Problem Solving Skills*. July. <https://doi.org/10.13140/2.1.2535.4882>
- Rosen, Y. (2015). Computer-based Assessment of Collaborative Problem Solving: Exploring the Feasibility of Human-to-Agent Approach. *International Journal of Artificial Intelligence in Education*, 25(3), 380–406. <https://doi.org/10.1007/s40593-015-0042-3>
- Rosen, Y. (2017). Assessing Students in Human-to-Agent Settings to Inform Collaborative Problem-Solving Learning. *Journal of Educational Measurement*, 54(1), 36–53. <https://doi.org/10.1111/jedm.12131>.
- Rummel, N., & Spada, H. (2005). Learning to collaborate: An instructional approach to promoting collaborative problem solving in computer-mediated settings. *Journal of the Learning Sciences*, 14(2), 201–241. https://doi.org/10.1207/s15327809jls1402_2
- Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors*, 50(3), 540–547. <https://doi.org/10.1518/001872008X288457>
- Scoular, C. (2017). *FROM LOG FILE ANALYSIS TO ITEM RESPONSE THEORY: A N ASSESSMENT TEMPLATE FOR MEASURING COLLABORATIVE PROBLEM SOLVING*. May.
- Shaffer, D. W. (2017). *Quantitative ethnography*. Madison, WI: Cathcart Press.
- Simpson A. (2017). Cracking her codes: understanding shared technology resources as positioning artifacts for power and status in CSCL

- environments. *Intern. J. Comput.-Support. Collab. Learn.*
<https://doi.org/10.1007/s11412-017-9261-y>
- Slavin, R. E. (2017). *Instruction based on cooperative learning*. In R. E. Mayer & P. A. Alexander (Eds.), *Handbook of research on learning and instruction* (pp. 388–404). New York, NY: Routledge Press.
- Smeaton, A. F., & Lee, H. (2009). *Collaborative Computing: Networking, Applications and Worksharing*. 10(August 2014).
<https://doi.org/10.1007/978-3-642-03354-4>
- Suwarma, I. R., & Krisna, I. I. (2019). *IDENTIFICATION OF SOCIAL AND COGNITIVE DOMAIN CRITERIA ‘KEYWORD’ ON COLLABORATIVE*. *Iceap*, 109–123.
- Tollefsen, D., & Ryan, K. (2019). Group Cognition. *The Routledge Companion to Philosophy of Psychology*, 766–782.
<https://doi.org/10.4324/9780429244629-48>
- Webb, N. M. (1995). Group collaboration in assessment: Multiple objectives, processes, and outcomes. *Educational Evaluation and Policy Analysis*, 17(2), 239–261. doi:10.3102/01623737017002239
- Wegner, D. M. (1987). Transactive Memory: A Contemporary Analysis of the Group Mind. *Theories of Group Behavior*, 185–208.
https://doi.org/10.1007/978-1-4612-4634-3_9
- Wilczenski, F. L., Bontrager, T., Ventrone, P., & Correia, M. (2001). Observing collaborative problem-solving processes and outcomes. *Psychology in the Schools*, 38(3), 269–277. <https://doi.org/10.1002/pits.1017>
- Wildman, J. L., Shuffler, M. L., Lazzara, E. H., Fiore, S. M., Burke, C. S., Salas, E., & Garven, S. (2012). Trust development in swift starting action teams: A multilevel framework. *Group and Organization Management*, 37(2), 137–170. <https://doi.org/10.1177/105960111434202>
- Yi, K., Kuang, L., Yu, C., Sheng, H., & Chang, Y. S. (2018). Effects of web - based versus classroom - based STEM learning environments on the development of collaborative problem - solving skills in junior high school students. *International Journal of Technology and Design Education*, 0123456789. <https://doi.org/10.1007/s10798-018-9488-6>