



Learning media for making electrical circuits using electronic workbench

Siti Nurhabibah Hutagalung¹, Melda Panjaitan²

¹Department Technical Information, Budi Darma University, Medan, Indonesia

²Department education, Budi Darma University, Medan, Indonesia

ARTICLE INFO

Article history:

Received Jan 4, 2024
Revised Jan 8, 2024
Accepted Jan 17, 2024

Keywords:

Electronic Workbench
Electrical Circuit
Elektronik

ABSTRACT

Computer media in the teaching and learning process in the classroom, can solve learning problems, namely, changing student learning patterns to be more effective by increasing knowledge and skills and can increase student motivation and ultimately can enhance student learning outcomes. EWB (Electronic Work Bench) is a type of electronic software used to simulate the workings of an electrical circuit. The need for electrical circuit simulation is to test whether the electrical circuit can run properly and in accordance with the theoretical approach used in electronic books, without having to make the electrical circuit in reality. The availability of minimal supporting learning media hinders the creation of effective learning activities so that the research team uses Electronic Workbench media in designing electronic components with targeted success. Students at Budi Darma University gave enthusiastic responses to this training seen from the number of student attendance and their response during the training and were able to understand electronic design, able to assemble simple electronic components using Electronic Workbench.

This is an open access article under the [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) license.



Corresponding Author:

Siti Nurhabibah Hutagalung,
Department Technical Information,
Budi Darma University,
Jl. Sisingamangaraja No.338, Siti Rejo I, Kec. Medan Kota, Kota Medan, Sumatera Utara 20219, Indonesia
Email: sitinurhabibahhutagalung1@gmail.com

INTRODUCTION

EWB (*Electronic Work Bench*) is one type *software* electronics used to simulate the workings of an electrical circuit (Ali, 2012). The need for electrical circuit simulation is to test whether the electrical circuit can run properly and in accordance with the theoretical approach used in electronic books, without having to make the electrical circuit in reality. simulations performed using EWB are simulations that produce ideal outputs (Singgih Purwadi, 2013). That is, output that is not affected by non-ideal factors such as interference (known as noise in electronics) as well as interference that often occurs in actual (real) electrical circuits. The use of EWB must be supported by basic knowledge of electronics (M.Isnaini, 2019). Electronic Workbench Software as a tool to solve the design problem of making electrical circuits (Teguh Arifianto, Yus Rizal, Sunaryo, M. Afif Amalul Arifidin, Damar Isti Pratiwi, Ainun Fikria, David Malaiholo, Hana Wardani Puruhita, 2022).

Without adequate basic knowledge of electronics such as how to use measuring instruments (oscilloscopes, multimeters and so on), of course, it will be more difficult to understand how to work from *software* Ini. *Software* it uses a GUI system (*Graphic User Interface*) as well as *Windows* so that the user *software* Those who already understand the basic knowledge of electronics will easily master the use of electronics *software* Ini (Ayu Suraya, 2018).

By using Electronics Workbench, students can learn to assemble electrical circuits and conduct virtual simulations in the form of interesting animations and provide an overview of how electrical circuits work (Taviv Sutisna, 2023). In addition, by using Electronics Workbench, students also do not need to buy the components needed to assemble electrical circuits and can reduce the occurrence of errors when assembling electrical circuits (Zulfadhly & Hambali, 2020). Electronics Workbench can be used very easily and practically, where all components will be displayed on the worksheet in the form of electronic symbols and classified by type. Electronics Workbench can be downloaded for free and can also be used for learning activities (Mentari dan Juru Bahasa Sinuraya, 2015). This EWB 5.12 application is very helpful for proving the output signal from logic gates in a digital circuit, and can also be used to perform other digital circuit experiments (Alhibarsyah, 2023)

A teaching and learning process has important components, namely teaching methods and learning materials. These two aspects are interrelated, the selection of one particular teaching method will affect the type of learning material that will be delivered to students (Setiawan & Susilo, 2017). Methods in delivering learning materials also vary according to the material to be delivered. Many ways are used in delivering learning material so that the material can be understood by students, including: lecture methods, exercises, questions and answers, field trips, demonstrations, sociodrama, role playing, discussion, assignment and resistance, experiments, and projects (SYAMSUL HIDAYAT, 2019). The purpose of information technology is to solve a problem, open creativity, increase effectiveness and efficiency in human activities (Kristina, Thommy Willay & Hutagaul, 2020).

Learning media that can be used varies, one of which is computer media (Islahudin & Sabaryati, 2018). Computer media in learning, namely media that uses computer-based technology, is a way of producing or delivering material using digital system-based sources (Hutagalung et al., 2020). With the existence of computer media in the teaching and learning process in the classroom, it can solve learning problems, namely, changing student learning patterns to be more effective by increasing knowledge and skills and can increase student motivation and ultimately can enhance student learning outcomes (Zulkarnain, 2018). The use of this analysis media makes the calculation of electric current more accurate and saves time (Nurullaeli, 2020). Media Interactive learning has a very high level of practicality to be used by teachers and students in the Electrical Circuit learning process (Tri & Yanto, 2019).

The availability of minimal supporting learning media hinders the creation of effective learning activities. Previous research to overcome the lack of availability of laboratory equipment at SMA Citra Harapan Percut Sei Tuan, especially in dynamic electrical circuit experiments, Electronic Workbench 5.12 software was developed in the form of simulations (Hutagalung et al., 2020). The lack of availability of laboratory equipment, especially in electrical circuit experiments, can be overcome by using simulation media because the results of Rosyanti & Sulistiyo's research on the use of electronic workbench (EWB) media there are differences in student learning outcomes in experimental classes that use EWB and Circuit Maker learning media with student learning outcomes in control classes without providing media (SYAMSUL HIDAYAT, 2019).

Research related to the use of Electronics Workbench software simulation has been carried out by several researchers. Research that has been conducted states that there is a significant influence between the use of Electronics Workbench software as a virtual laboratory on understanding basic electronics concepts and can improve student learning outcomes (Islahudin & Sabaryati, 2018). Application of learning models *discovery learning* with *inquiry learning* Based

software EWB (*Electronics Workbench*) has a different influence on learning outcomes (P et al., 2019). Other research that has been done states that Electronics Workbench software can improve student learning outcomes in Basic Electrical and Electronics subjects (1. Ikhsan Parinduri 2. Siti Nurhabibah Hutagalung, 2018). The electrical circuit analysis method can be simulated using Electronics Workbench software. This software can prove the correctness of the results of electrical circuit analysis that has been carried out so that it can be implemented in learning activities (Anugrah, 2022). Virtually not much different from using the original components and devices (Vormes Gema Merdeka, Najwa Zahratul, Diar Dwi Sutia & Muhammad Gani Baihaqi Darussalam⁴, Ridha Febriliana, Riska Putri Anggraini, 2022). Some even combine electronic workbench software with Proteus software (Siti Nurhidayah, Didik Aribowo, 2020).

So far, students learn the series of electronics and the introduction of electronic components without any visual simulation with special electronic media or software. The availability of minimal supporting learning media hinders the creation of effective learning activities. To overcome the lack of availability of laboratory equipment, software called Electronic Workbench is used. To help students' analytical thinking process, this study aims to use Electronics Workbench software simulation. Based on this background, the research team conducted research on Learning Media for Making Electrical Circuits Using Electronic Workbench conducted at Budi Darma University.

RESEARCH METHODOLOGY

The implementation of this research uses a descriptive analysis study method on electrical circuit analysis methods using Electronics Workbench software simulations. This research was conducted at Budi Darma University. The process of conducting research is shown in figure 1.

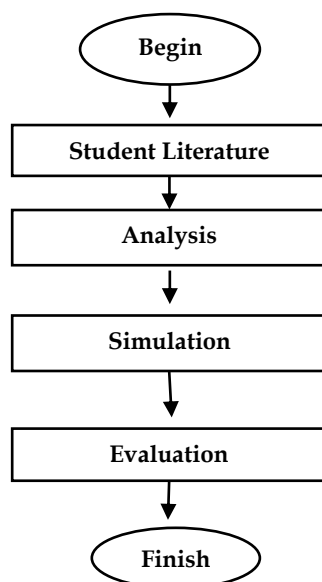


Figure 1. Implementation method flow chart

The research began by conducting a literature study to obtain information related to electrical circuits using Electronic Workbench software. After the information was obtained, the study continued by analyzing the electrical circuit. The results of the analysis were simulated using Electronics Workbench software. The study ended with an evaluation.

RESULTS AND DISCUSSION

Electronics Workbench is an electronic software that can be used to simulate electrical circuits. By using Electronics Workbench, students can learn to assemble electrical circuits and conduct virtual simulations in the form of interesting animations and provide an overview of how electrical circuits work. In addition, by using Electronics Workbench, students also do not need to buy the components needed to assemble electrical circuits and can reduce the occurrence of errors when assembling electrical circuits. Electronics Workbench can be used very easily and practically, where all components will be displayed on the worksheet in the form of electronic symbols and classified by type. Electronics Workbench can be downloaded for free and can also be used for learning activities. This greatly supports the learning process carried out at Budi Darma University



Figure 2. Implementation of electronic workbench training activities

The advantages of using EWB in simulating electronic circuits include: (1) it does not need to take a lot of time and cost to buy electronic components needed for practical activities; (2) in the use of EWB software is very easy and practical, electronic components are displayed in the workspace in the form of symbols and classified according to the type of components; (3) no more abilities and skills are needed as well as designing the actual circuit, namely soldering, connecting, installing components mechanically so as to shorten the time; (4) does not require large funds to buy measurement instruments such as ammeters, voltmeters, multimeters and oscilloscopes because in the EWB software measurement instruments are sufficient; (5) There is no need to be afraid if there is a mistake in connecting which will result in damage to equipment where electronic devices are quite expensive

Electronics Workbench is able to visualize basic concepts from the world of electronics. Electronics Workbench provides several components that are presented virtually and can be assembled into an electrical circuit. These components can be assembled into an electrical circuit on the Electronics Workbench software worksheet as shown in figure 3.

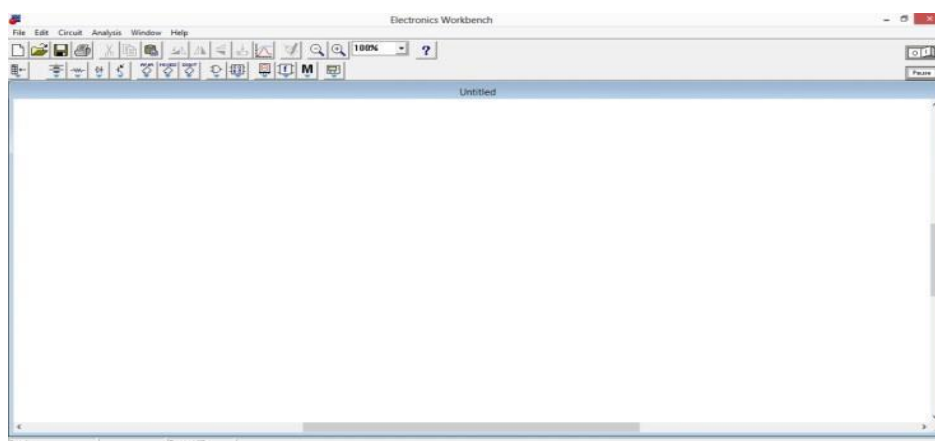


Figure 3. Worksheet on *electronic workbench*

Broadly speaking, in the use of Electronics Workbench, there are three things, namely how to use the measuring instruments provided, the use of electronic components and also the formation of circuits.



Figure 4. Measuring instruments in electronic workbench

On the far right of the EWB software there is an instrument *toolbar*. If the bar is pressed it will display the measuring instruments contained in this software there are several such as for example multimeters, logic analyzers, oscilloscopes and there are still several other measuring instruments.

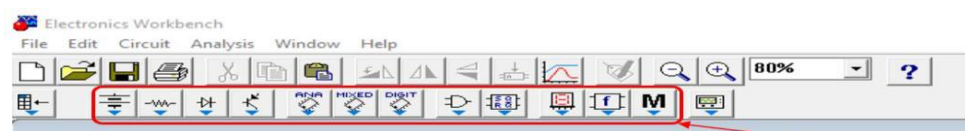


Figure 5. Electronic workbench components

Electronics Workbench has provided electronic components found on pallet components. To retrieve a component, the trick is to click the component group toolbar.



Figure 6. Voltage source components in an electronic workbench

Several types of voltage sources are displayed When we press the voltage source blade, there are about 13 categories of components, namely: Source, Basic, Diode, Transistor, Analog, Digital, Mix, Logic Gate, Indicator.

Developing learning media to improve the development process of the progress of student learning interest, the basis for making and designing electronics with Electronic Workbench is carried out at Budi Darma University. The basic Electronic Workbench training that has been carried out can be said to have succeeded in spurring the interest of students in making electronic design, and there are even some students who have made the series of components to the calculation of electronic devices better than expected.

CONCLUSION

The conclusion of the implementation of learning media training activities on making electrical circuits using electronic workbench software at Budi Darma University is: The implementation team has successfully implemented the Electronic Workbench basic training program in the design of electronic components with targeted success. Students at Budi Darma University gave enthusiastic responses to this training seen from the number of student attendance and also from their responses during the training. Students are able to understand electronic design, able to assemble simple electronic components using Electronic Workbench. To train students' skills, the use of other electronic simulation software is also needed, considering that Electronics Workbench software is not the only electronic simulation software that can be used to prove the results of

electrical circuit analysis. Based on the results of the research, simulation-based practicum activities like this need to be applied in the learning process.

References

- Alhibarsyah, Y. S. (2023). Simulasi gerbang logika menggunakan aplikasi electronic workbench (ewb). *Jurnal Informasi Dan Komputer*, 11(1), 8–15.
- Ali, M. (2012). *SIMULASI RANGKAIAN ELEKTRONIKA ANALOG*. 5.
- Anugrah, D. (2022). Penerapan Hukum Kirchhoff dan Hukum Ohm pada Analisis Rangkaian Listrik Menggunakan Software Electronics Workbench. *Journal of Systems, Information Technology, and Electronics Engineering*, 2(2), 1–11.
- Ayu Suraya. (2018). Pengaruh Penggunaan Media Pembelajaran Software Electronics Workbench Terhadap Hasil Belajar Siswa Pada Kompetensi Dasar Menerapkan Macam-Macam Rangkaian Flip-Flop Kelas X Di SMKN 1 Madiun. *Jurnal Pendidikan Teknik Elektro*, 3(2), 289–294.
- Hutagalung, S. N., Yanny, A., & Hutabarat, S. A. (2020). Pelatihan Electronics Workbench (EWB) Dalam Pembelajaran Fisika Bagi Siswa/i di SMA Citra Harapan Percut. *Journal of Social Responsibility Projects*, 1(1), 9–11.
- Ikhsan Parinduri & Siti Nurhabibah Hutagalung. (2018). *Simulasi Rangkaian Hamming Code Menggunakan Electronic Workbench Dan Matlab Simulink*. 9986(September), 1–4.
- Islahudin, I., & Sabaryati, J. (2018). Pelatihan Pemasangan Lampu Listrik Bersaklar Di Rumah Tangga Menggunakan Konsep Ewb (Electronics Workbench) Bagi Siswa Smkn I Batu Kliang Utara Desa Aik Beriq Kecamatan Batu Kliang Utara Kabupaten Lombok Tengah Tahun 2017. *SELAPARANG Jurnal Pengabdian Masyarakat Berkemajuan*, 1(2), 5. <https://doi.org/10.31764/jpmb.v1i2.455>
- Kristina, Thommy Willay, W., & Hutagaul. (2020). Penerapan metode eliminasi dan substitusi pada rancangan aplikasi penyelesaian sistem persamaan linier. *Jurnal InTekSis*, 7(1), 80–89.
- M.Isnaini, I. (2019). *PEMANFAATAN LABORATORIUM VIRTUAL BERBASIS SOFTWARE ELECTRONICS WORKBENCH (EWB) UNTUK MENUNJANG PEMAHAMAN KONSEP MAHASISWA PADA MATA KULIAH ELEKTRONIKA DASAR I*. 5(2), 96–100.
- Mentari dan Juru Bahasa Sinuraya. (2015). *PENGARUH MODEL PEMBELAJARAN INKUIRI BERBANTU E L E C T R O N I C HASIL BELAJAR FISIKA PADA MATERI POKOK LISTRIK DINAMIS DI S W O R K B E N C H TERHADAP KELAS X SEMESTER II SMA NEGERI 1 BINJAI T.P. 2013/2014*. 3(2).
- Nurullaeli. (2020). Media Analisis Rangkaian Listrik Menggunakan Pendekatan Numerik Gauss-Jordan, Gauss-Seidel, dan Cramer. *Navigation Physics*, 2(1), 1–8.
- P, E. Y., Sulistyaning, K., & Y, A. C. (2019). *Perbedaan Pengaruh Model Pembelajaran Discovery Learning dengan Inquiry Learning Berbasis Software EWB (Electronics Workbench) pada Mata Pelajaran Dasar Listrik dan Elektronika Terhadap Hasil Belajar Siswa*. 04(September), 25–29.
- Setiawan, R., & Susilo, S. (2017). Pengembangan LKS berbantuan media electronic workbench untuk meningkatkan nilai karakter siswa pada bahasan listrik dinamis. *UPEJ Unnes Physics Education Journal*, 6(3).
- Singgih Purwadi, J. (2013). *PENGARUH MODEL PEMBELAJARAN AKTIF TIPE ACTIVE OBSERVATION AND FEEDBACK DAN MODEL PEMBELAJARAN LANGSUNG TERHADAP HASIL BELAJAR SISWA PADA STANDAR KOMPETENSI MEMAHAMI PENGUKURAN KOMPONEN ELEKTRONIKA DI SMK NEGERI 2 SURABAYA Singgih Purwadi , Joko Abstrak*. 02(1), 123–130.
- Siti Nurhidayah, Didik Aribowo, D. (2020). Penerapan Aplikasi Simulasi Electronic Workbench dan Proteus pada Materi Penerapan Rangkaian Elektronika bagi Siswa Kelas XI Teknik Elektronika Industri. *JEE Jurnal Edukasi Elektro*, 4(2), 120–128.
- SYAMSUL HIDAYAT. (2019). *ENGGUNAAN SOFTWARE SIMULASI ELEKTRONIKA SEBAGAI MEDIA BELAJAR PADA POKOK BAHASAN LISTRIK DINAMIS UNTUK MENINGKATKAN KETERAMPILAN PESERTA DIDIK KELAS X1 SMA NEGERI 2 POLOMBANGKENG UTARA KAB. TAKALAR*. In *Angewandte Chemie International Edition*, 6(11), 951–952. (Issue Mi).
- Taviv Sutisna. (2023). *Tutorial Electronic WorkBench*. 1–18.
- Teguh Arifianto, Yus Rizal, Sunaryo, M. Afif Amalul Arifidin, Damar Isti Pratiwi, Ainun Fikria, David Malaiholo, Hana Wardani Puruhita, L. S. M. (2022). *PENGGUNAAN SOFTWARE ELECTRONIC WORK BENCH (EWB) UNTUK PELATIHAN PERANCANGAN PEMBUATAN RANGKAIAN ELEKTRONIKA DI KALIREJO KABUPATEN PASURUAN*. *Madiun Spoor : Jurnal Pengabdian Masyarakat Politeknik*, 2(2), 10–16.

- Tri, D., & Yanto, P. (2019). Praktikalitas Media Pembelajaran Interaktif Pada Proses Pembelajaran Rangkaian Listrik. *INVOTEK*, 19(1), 75–82. <https://doi.org/10.24036/invotek.v19vi1.409>
- Vormes Gema Merdeka, Najwa Zahratul, Diar Dwi Sutia, & Muhammad Gani Baihaqi Darussalam⁴, Ridha Febriliana, Riska Putri Anggraini, N. H. (2022). ANALISIS DIODA PADA RANGKAIAN RECTIFIER DENGAN SOFTWARE ELECTRONICS WORKBENCH. *Jurnal Ilmiah Informatian Technology d'Computare*, 12(8.5.2017), 2003–2005.
- Zulfadhly, M., & Hambali. (2020). Penerapan Media Electronic Workbench Simulator pada Mata Pelajaran Dasar Listrik Elektronika di SMK N 5 Padang. *JTEV (Jurnal Teknik Elektro Dan Vokasional)*, 6(2), 352–360.
- Zulkarnain, I. (2018). *Pemanfaatan Laboratorium Virtual Berbasis EWB (Electronics Workbench) Terhadap Peningkatan Hasil Belajar Fisika Siswa IPA Kelas XII IPA MA NW Darussalimin Sengkol, Batukliang Lombok Tengah Tahun Pelajaran 2018/2019*. 4(November 2018), 47–51.