Development Of CAD Autodesk Inventor Teaching Modules for Schools Class XI Technical Jurisdent of Material Fabrication and Manufacturers at SMK Negeri 1 Seyegan

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ABSTRACT

This study aims to find out the results of the development of CAD modules in Autodesk Inventor, know the level of validity of the CAD module, and know the response of the students to the module in AutoDesk Inventor. This type of research uses the method of research and development (R&D) with the 4-D development model. The research subject consists of media experts, material experts, and pupils of 33 Class XI of the Engineering Department of Metal Manufacture and Manufacturing at SMK Negeri 1 Seyegan. Research data is taken from the lift for media experts and material experts in evaluating the level of qualification and the lift for pupils to obtain practical responses to the teaching module. Data analysis using descriptive quantum analysis. The result of this study is to produce a teaching module that contains six modules of teaching materials: CAD, Autodesk Inventor, and LKPD (Lembar Kegiatan Peserta Didik). The evaluation of the media experts was in the category "Very Worth" with a rating of 91.49%. The assessment of the expert material gets the category "very worthy" with a rating of 84.13%. Based on the responses of the students, they obtained the category "very good" with a score of 85.9%, and the evaluation against the LKPD was 87,57% with a category "very good".

Keywords: Teaching Module, Autodesk Inventor, Research and Development (R&D), 4-D Development Model, Module Feasibility.

INTRODUCTION

The purpose of education is defined as a system of agreed-upon and important values to be achieved through various activities, both inside and outside of school (Aryanto 2021: 5). Law No. 20 of 2003 concerning the National Education System states that the purpose of education is to develop students' potential into individuals who are devout to God Almighty, possess noble character, are healthy, knowledgeable, skilled, and independent. The Indonesian Ministry of Education and Culture launched a new curriculum called the Independent Curriculum in an effort to improve national education. The curriculum has undergone changes over time to develop the existing education system and find the best curriculum to achieve national education goals (Friska, 2020: 2). One of the goals of using the Independent Curriculum is to help teachers use prepared methods and resources more systematically and efficiently. The Independent Curriculum has teaching modules designed to give teachers and students more flexibility, allowing learning to be more student-focused and tailored to their needs. Lack of knowledge and insight into CAD material is a problem experienced by students. Another problem that arose, as explained by educators, was the difficulty of adapting the CAD software used, Autodesk Inventor 2025, to the existing teaching module using Autodesk Inventor 2016. Students found it difficult to adapt to the features of Autodesk Inventor 2025. If the learning process is not well planned for the teaching module, the content will certainly be delivered to students in an unsystematic manner. As a result, there is an imbalance in learning between teachers and students. (Difinubun 2022: 3).

The curriculum updates and newly implemented learning methods at SMK Negeri 1 Seyegan also contributed to the lack of direction in learning objectives. Rindayati (2022) explains that with the changing curriculum and several changes in the preparation of learning materials, teachers face challenges in developing their own learning materials. External factors, such as previous familiarity with teacher and student textbooks, are among these factors. Consequently, educators must be innovative and creative when developing learning materials.

Furthermore, the creation of teaching modules that do not fully align with the applicable curriculum results in a mismatch between the material taught and the material tested.

Teaching modules help students learn independently. The creation of teaching modules is based on students' current learning achievements and learning achiev

ements of the long-term development phase as well as materials relevant to learning objectives (Difinubun 2022:4). This is based on the explanation of the subject teacher of Engineering Design and Metal Fabrication Manufacturing Drawing that CAD learning requires an adequate teaching module with current facilities in student learning activities and helps educators in delivering material to match learning outcomes. The Autodesk Inventor CAD teaching module is a teaching material used to improve the teaching and learning process in the subject of Engineering Design and Metal Fabrication Manufacturing Drawing which is compiled in soft file form. This module contains materials from CAD according to learning objectives based on Learning Outcomes equipped with learning methods that are appropriate to the appropriate learning process.

The background above makes researchers want to develop learning resources in the form of teaching modules, this teaching module aims to help educators in providing materials in learning and assist students when learning the material being taught. The research that will be conducted by researchers is entitled "Development of Autodesk Inventor CAD Teaching Modules for Grade XI Students Majoring in Metal Fabrication and Manufacturing Engineering at SMK Negeri 1 Seyegan".

METHODOLOGY

This study employed a Research and Development (R&D) approach using the Four-D (4-D) instructional development model. As described by Sugiyono (2013, p. 297), R&D is used to develop or refine a product and evaluate its effectiveness. The approach was selected because the present study focused on developing an instructional product and assessing its feasibility. The 4-D model introduced by Thiagarajan et al. (1974, p. 5) comprises Define, Design, Develop, and Disseminate. The present evaluation addressed product feasibility and student responses; it did not experimentally establish instructional effectiveness.

The study applied the 4-D research and development model to the preparation, expert review, revision, and initial dissemination of an Autodesk Inventor-based Computer-Aided Design (CAD) teaching module. The resulting quantitative evaluation data were analyzed descriptively.

Research Setting and Participants

Department at SMK Negeri 1 Seyegan. The study began on April 3, 2025. The target users were Grade XI students in the department. The development and evaluation involved subject-matter and media experts drawn from teachers and university lecturers, as well as Grade XI students. The product trial described in the article involved 33 students; the expert-validation results were obtained from two media experts and two subject-matter experts.

Development Procedures

Table 1: The four stages proposed by Thiagarajan et al. (1974) were implemented as follows:

Stage	Purpose and implementation
1. Define	Identify instructional needs and gather relevant information on the teaching product to be developed.
2. Design	Prepare the Autodesk Inventor CAD teaching module based on information obtained during the needs-identification stage.
3. Develop	Produce, validate, and revise the teaching module in response to evaluations and recommendations from experts.
4. Disseminate	Communicate the revised and updated module for practical Autodesk Inventor CAD instruction and provide the product to the teacher responsible for the GTPFLM subject.

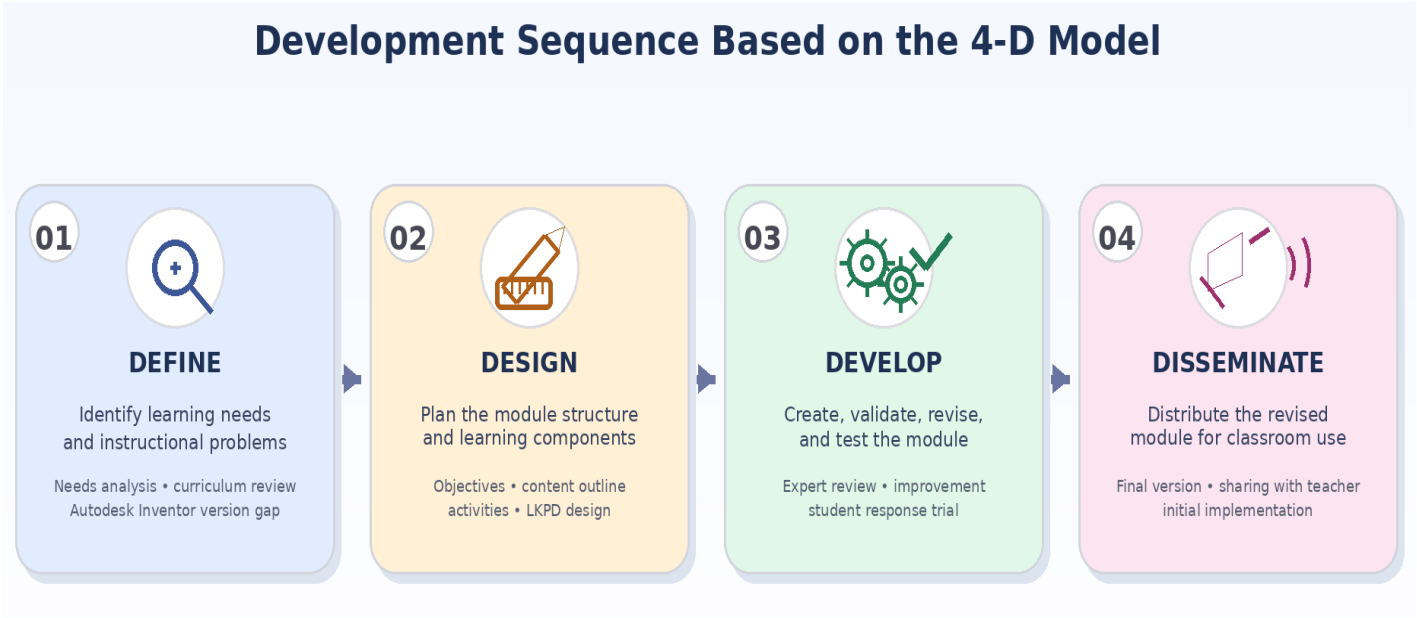


Figure 1: Development sequence based on the 4-D model

Data Sources, Instruments, and Data Collection

Data were gathered through several complementary collection techniques to obtain information relevant to the feasibility of the developed module. Two instruments were used: a structured interview guide and closed-ended questionnaires.

1. Structured interview. A structured interview was conducted with Ibnu Saputro, S.Pd., the teacher of Engineering Design and Manufacturing Drawing for Metal Fabrication at SMK Negeri 1 Seyegan. The interview provided information about existing CAD learning conditions and instructional-material needs.
2. Questionnaires. Closed-ended questionnaires presented predetermined response options. In accordance with the Likert-scale approach described by Sugiyono (2017, p. 93), respondents assessed statements reflecting attitudes, responses, and understanding of the learning materials. The measured constructs were represented by indicators and questionnaire statements, each rated on a four-point scale. Questionnaires were administered to expert validators and students to obtain assessments of module feasibility and responses to the teaching materials.

Table 2. Scoring Guidelines for the Questionnaires

Response option	Score
Strongly Agree (SA)	4
Agree (A)	3
Disagree (D)	2
Strongly Disagree (SD)	1

Data Analysis

A four-point Likert scale was used to assess the feasibility of the developed instructional product. Numerical scores obtained from the media-expert, subject-matter-expert, and student questionnaires were analyzed using descriptive quantitative techniques and subsequently interpreted through qualitative feasibility categories. The scoring and interpretation procedures followed the references cited in the original study (Arikunto, 2012, p. 244, as cited in Ferly, 2019, p. 42; Sugiyono, 2019, p. 146).

First, the mean assessment score was determined using:

$$\bar{x} = \frac{\Sigma X}{N} \quad (1)$$

where $\bar{x}$ is the mean assessment score, ΣX is the sum of the recorded assessment scores, and N is the number of scored observations included in the calculation. The resulting mean scores were interpreted using the classification intervals presented in Table 3.

Table 3. Teaching Module Feasibility Categories

Mean score interval	Feasibility category
$3.25 < \bar{x} \leq 4.00$	Highly Feasible
$2.50 < \bar{x} \leq 3.25$	Feasible
$1.75 < \bar{x} \leq 2.50$	Not Feasible
$1.00 \leq \bar{x} \leq 1.75$	Highly Not Feasible

Second, percentage-based feasibility was calculated by dividing the observed score by the ideal maximum score and multiplying the result by 100%, as described by Sugiyono (2013, p. 559):

$$P = \frac{\Sigma S_o}{\Sigma S_m} \times 100\% \quad (2)$$

where P is the feasibility percentage, ΣS_o is the total observed score, and ΣS_m is the total maximum possible (ideal) score for the same assessment items and respondents. Expert-validation percentages were summarized descriptively and classified according to Sugiyono (2019), as shown in Table 4.

Table 4. Product Feasibility Criteria (Sugiyono, 2019)

Percentage interval	Feasibility category
$0\% \leq P \leq 25\%$	Highly Not Feasible
$25\% < P \leq 50\%$	Not Feasible
$50\% < P \leq 75\%$	Moderately Feasible
$75\% < P \leq 100\%$	Highly Feasible

The scores were reported separately for expert reviews and student responses. Descriptive interpretations were used to determine the perceived feasibility of the Autodesk Inventor CAD teaching module and its accompanying student worksheets (LKPD).

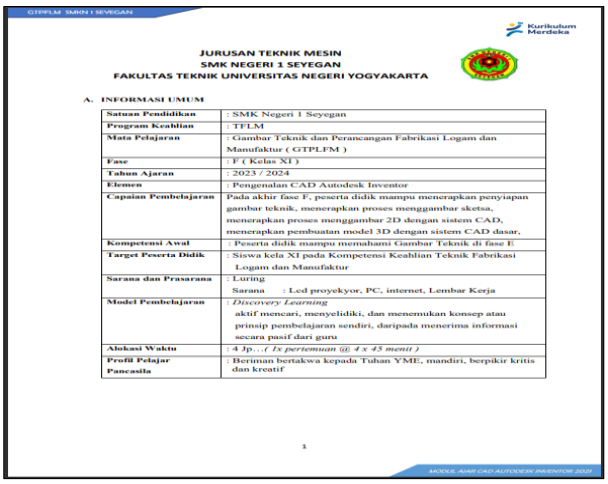
RESULTS AND DISCUSSION

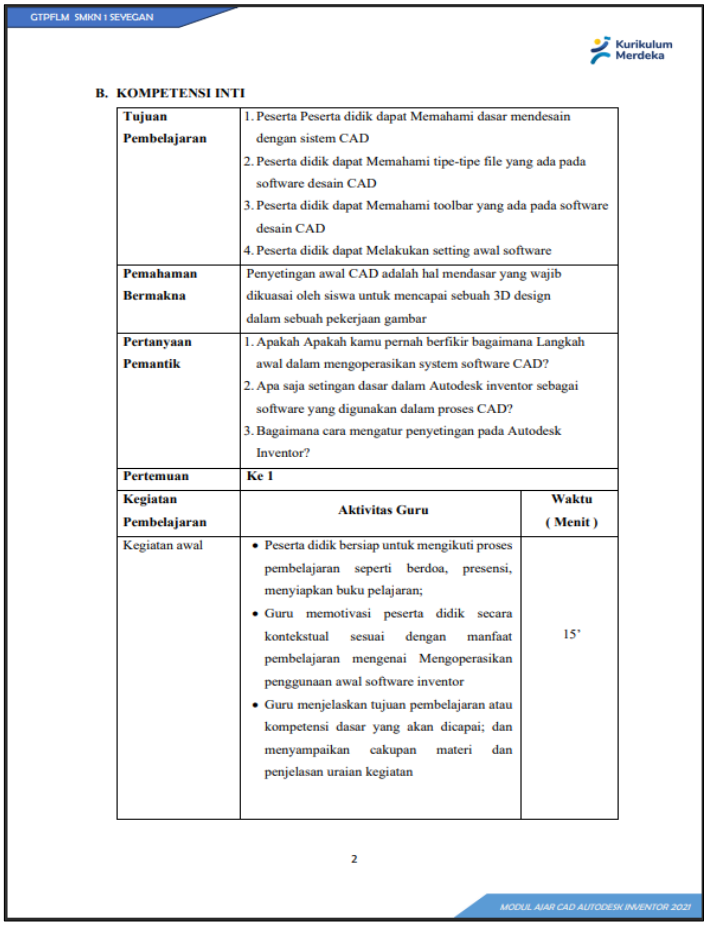
RESULT

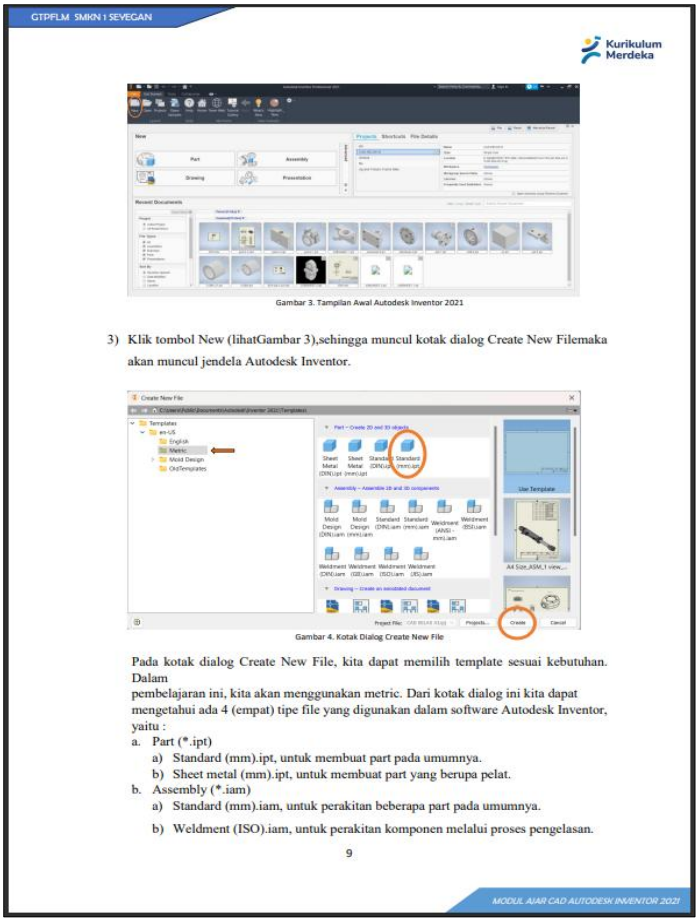
Development of the Autodesk Inventor CAD Teaching Module

The research produced an Autodesk Inventor CAD teaching module comprising six instructional units aligned with Phase F learning outcomes of the Merdeka Curriculum. The learning outcomes were translated into instructional objectives and a sequence of learning activities. The module introduces the Autodesk Inventor interface and basic operations, progresses through drawing and modeling tools, and addresses part assembly using the available assembly features. It also incorporates Student Worksheets (Lembar Kegiatan Peserta Didik, LKPD) to support guided practical activities. Figure 2 presents examples of the developed module components.

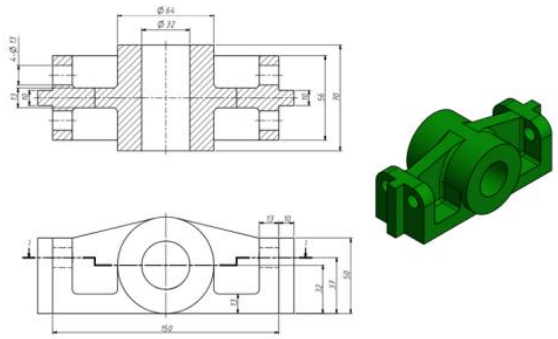

MODUL AJAR
PENGOPERASIAN DASAR
CAD AUTODESK INVENTOR
Gambar Teknik dan Perancangan Fabrikasi Logam dan Manufaktur
KELAS XI TEKNIK MESIN
Penulis :
Muhammad Bintang Rizaldi
Kurikulum Merdeka


GTPFLM SMKN 1 SEYEGAN
Kurikulum Merdeka
JURUSAN TEKNIK MESIN
SMK NEGERI 1 SEYEGAN
FAKULTAS TEKNIK UNIVERSITAS NEGERI YOGYAKARTA
A. INFORMASI UMUM
Satuan Pendidikan : SMK Negeri 1 Seyegan
Program Keahlian : TFLM
Mata Pelajaran : Gambar Teknik dan Perancangan Fabrikasi Logam dan Manufaktur (GTPLFM)
Fase : F (Kelas XI)
Tahun Ajaran : 2023 / 2024
Elemen : Pengenalan CAD Autodesk Inventor
Capaian Pembelajaran : Pada akhir fase F, peserta didik mampu menerapkan penyiapan gambar teknik, menerapkan proses menggambar sketsa, menerapkan proses menggambar 2D dengan sistem CAD, menerapkan pembuatan model 3D dengan sistem CAD dasar,
Kompetensi Awal : Peserta didik mampu memahami Gambar Teknik di fase E
Target Peserta Didik : Siswa kela XI pada Kompetensi Keahlian Teknik Fabrikasi Logam dan Manufaktur
Sarana dan Prasarana : Luring
Sarana : Led proyekyor, PC, internet, Lembar Kerja
Model Pembelajaran : Discovery Learning
aktif mencari, menyelidiki, dan menemukan konsep atau prinsip pembelajaran sendiri, daripada menerima informasi secara pasif dari guru
Alokasi Waktu : 4 Jp...(1x pertemuan @ 4 x 45 menit)
Profil Pelajar Pancasila : Beriman bertakwa kepada Tuhan YME, mandiri, berpikir kritis dan kreatif
MODUL AJAR CAD AUTODESK INVENTOR 2021

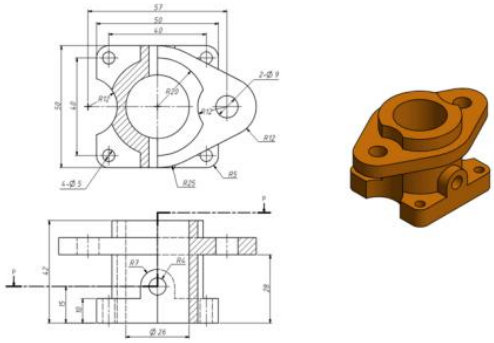

GTPFLM SMKN 1 SEYEGAN
Kurikulum Merdeka
B. KOMPETENSI INTI
Tujuan Pembelajaran
1. Peserta Peserta didik dapat Memahami dasar mendesain dengan sistem CAD
2. Peserta didik dapat Memahami tipe-tipe file yang ada pada software desain CAD
3. Peserta didik dapat Memahami toolbar yang ada pada software desain CAD
4. Peserta didik dapat Melakukan setting awal software
Pemahaman Bermakna
Penyetingan awal CAD adalah hal mendasar yang wajib dikuasai oleh siswa untuk mencapai sebuah 3D design dalam sebuah pekerjaan gambar
Pertanyaan Pemantik
1. Apakah Apakah kamu pernah berfikir bagaimana Langkah awal dalam mengoperasikan system software CAD?
2. Apa saja setingan dasar dalam Autodesk inventor sebagai software yang digunakan dalam proses CAD?
3. Bagaimana cara mengatur penyetingan pada Autodesk Inventor?
Pertemuan
Ke 1
Kegiatan Pembelajaran
Aktivitas Guru
Waktu (Menit)
Kegiatan awal
• Peserta didik bersiap untuk mengikuti proses pembelajaran seperti berdoa, presensi, menyiapkan buku pelajaran;
• Guru memotivasi peserta didik secara kontekstual sesuai dengan manfaat pembelajaran mengenai Mengoperasikan penggunaan awal software inventor
• Guru menjelaskan tujuan pembelajaran atau kompetensi dasar yang akan dicapai; dan menyampaikan cakupan materi dan penjelasan uraian kegiatan
15'
2
MODUL AJAR CAD AUTODESK INVENTOR 2021


GTPFLM SMKN 1 SEYEGAN
Kurikulum Merdeka
Gambar 3. Tampilan Awal Autodesk Inventor 2021
3) Klik tombol New (lihatGambar 3),sehingga muncul kotak dialog Create New Filemaka akan muncul jendela Autodesk Inventor.
Gambar 4. Kotak Dialog Create New File
Pada kotak dialog Create New File, kita dapat memilih template sesuai kebutuhan. Dalam
pembelajaran ini, kita akan menggunakan metric. Dari kotak dialog ini kita dapat mengetahui ada 4 (empat) tipe file yang digunakan dalam software Autodesk Inventor, yaitu :
a. Part (*.ipt)
a) Standard (mm).ipt, untuk membuat part pada umumnya.
b) Sheet metal (mm).ipt, untuk membuat part yang berupa pelat.
b. Assembly (*.iam)
a) Standard (mm).iam, untuk perakitan beberapa part pada umumnya.
b) Weldment (ISO).iam, untuk perakitan komponen melalui proses pengelasan.
9
MODUL AJAR CAD AUTODESK INVENTOR 2021

JOB 7



JOB 8



Lembar Kerja Peserta Didik (Teori)

Pengayaan

Mata Pelajaran : Perancangan Teknik dan Gambar Manufaktur Fabrikasi Logam

Kelas : XI Teknik Fabrikasi Logam dan Manufaktur (TFLM)

Materi : Menerapkan rancangan teknik dengan sistem CAD 3D.

Indikator Pencapaian

1. Menerapkan rancangan teknik dengan sistem CAD 3D
2. Memahami materi Assembly Autodesk Inventor
3. Mengetaahui penggunakan fitur yang ada pada Assembly

Tujuan Pembelajaran :

1. Setelah proses kegiatan pembelajaran yang telah diberikan oleh pendidik, peserta didik Peserta didik dapat menerapkan rancangan teknik dengan sistem CAD 3D dengan benar
2. Setelah proses kegiatan pembelajaran yang telah diberikan oleh pendidik, peserta didik Peserta didik dapat memahami materi Assembly dengan baik
3. Setelah proses kegiatan pembelajaran yang telah diberikan oleh pendidik, Peserta didik dapat menggunakan fitur yang ada pada Assembly dengan benar

Nama :

Kelas :

Pedoman Pengerjaan :

1. Kerjakan soal plihan ganda tersebut dengan benar
2. Kumpulkan jika sudah selesai mnegerjakan
3. Pendidik akan menilai hasil kerja peserta didik yang telah dikerjakan

TES TERTULIS

1. Apa yang dimaksud dengan "assembly" dalam konteks perangkat lunak Autodesk Inventor?
2. Apa itu "constraint" dalam konteks assembly?
3. Apa fungsi dari "mates" dalam proses pembuatan assembly?
4. Apa fungsi dari Angle dan bagaimana cara membuatnya ?
5. Bagaimana cara menambahkan komponen ke dalam subassembly?
6. Apa yang dimaksud dengan "exploded view" dalam assembly?
7. Apa perbedaan antara "motion constraints" dan "assembly constraints"?
8. Jelaskan fungsi dari Content Center dan bagaimana menggunakan fitur tersebut?
9. Apa yang dimaksud Design Accelerator ?
10. Bagaimana proses membuat roda gigi otomatis pada fitur assembly?

GLOSARIUM

Part : *Part dalam Autodesk Inventor merujuk pada sebuah komponen individu dari suatu assembly. Ini adalah elemen dasar dalam proses desain, yang bisa berupa objek tunggal*

Design Accelerator : *Design Accelerator adalah sekumpulan alat dan fitur di dalam Autodesk Inventor yang membantu dalam pembuatan komponen mekanis standar seperti gears, shafts, bearings, springs, dan fasteners.*

Gear : *Gear dalam konteks Autodesk Inventor merujuk pada komponen yang digunakan untuk mentransmisikan daya mekanis melalui gigi-gigi yang bersinggungan.*

Insert : *Insert adalah perintah dalam Autodesk Inventor yang digunakan untuk menempatkan komponen atau sub-assembly ke dalam assembly yang lebih besar.*

View : *View dalam Autodesk Inventor mengacu pada berbagai cara menampilkan model atau assembly di dalam jendela grafik. Ini mencakup berbagai tampilan seperti isometric, front, top, side, dan perspective view.*

DAFTAR PUSTAKA

Autodesk Student Free Educational Resources. (2024). Retrieved from https://www.autodesk.com/education/students

Buku Guru Mata Pelajaran Perancangan Teknik dan Gambar Manufaktur Fabrikasi Logam, XI Teknik Fabrikasi Logam dan Manufaktur (TFLM)

Figure 2. Presents examples of the developed module components

The examples in Figure 2 illustrate how the instructional content, practical activities, and supporting documentation were organized in the module. The six units were designed to support a structured progression from introductory CAD concepts to the application of three-dimensional engineering design.

Expert Validation of the Teaching Module

Expert evaluation was conducted to establish the feasibility of the developed module and identify aspects requiring revision. The assessments involved media experts and subject-matter experts from academic and vocational education settings. The results are presented separately to distinguish the evaluation of instructional media from the evaluation of learning content

Table 5. Media expert validation results: university lecturer.

No.	Aspect	Obtained Score	Mean Score	Result (%)	Category
1	Appearance	26	3.71	92.8%	Highly Feasible
2	Content	15	3.75	93.75%	Highly Feasible
3	Consistency	12	4	100%	Highly Feasible
4	Usefulness	24	4	100%	Highly Feasible
	Total	**77**	**3.86**	**96.63%**	**Highly Feasible**

Table 6. Media expert validation results: vocational school teacher.

No.	Aspect	Obtained Score	Mean Score	Result (%)	Category
1	Appearance	25	3.57	89.28%	Highly Feasible
2	Content	13	3.25	81.25%	Highly Feasible
3	Consistency	10	3.33	83.3%	Highly Feasible
4	Usefulness	22	3.6	91.6%	Highly Feasible
	Total	**70**	**3.43**	**86.35%**	**Highly Feasible**

As presented in Tables 5 and 6, the two media experts assessed the module and provided an overall mean score of 3.64, equivalent to 91.49% of the maximum possible score. Based on the product-feasibility criteria, the result was classified as highly feasible. Figure 3 retains the original comparison of media expert evaluation percentages. These findings indicate favorable expert judgments of the media-related aspects evaluated, but should not be interpreted as evidence of improved learning outcomes.

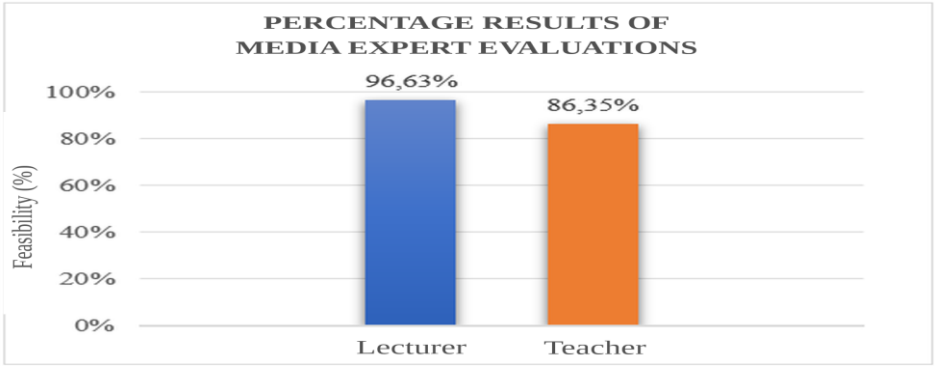


Figure 3. Percentage results of media expert evaluations.

The subject-matter evaluation addressed the instructional content, language, presentation, and benefits of the module. Two validators, comprising a university lecturer and a vocational school teacher, assessed the module. Their individual assessments are reported in Tables 7 and 8, followed by the original percentage comparison in Figure 3.

Table 7. Subject-matter expert validation results: university lecturer.

No.	Aspect	Obtained Score	Mean Score	Result (%)	Category
1	Content	28	3.5	87.5%	Highly Feasible
2	Language	18	3.6	90%	Highly Feasible
3	Presentation	15	3.75	93.75%	Highly Feasible
4	Usefulness	13	3.25	81.25%	Highly Feasible
	Total	**74**	**3.52**	**88.12%**	**Highly Feasible**

Table 8. Subject-matter expert validation results: vocational school teacher.

No.	Aspect	Obtained Score	Mean Score	Result (%)	Category
1	Content	25	3.125	78.12%	Feasible
2	Language	16	3.2	80%	Highly Feasible
3	Presentation	14	3.5	87.5%	Highly Feasible
4	Usefulness	12	3	75%	Feasible
	Total	**67**	**3.20**	**80.15%**	**Highly Feasible**

The combined subject-matter expert assessment yielded a mean score of 3.36 and a feasibility percentage of 84.13%, classified as highly feasible under the assessment criteria used in this study. The results support the appropriateness of the evaluated instructional content, language, and presentation for the intended teaching context. The media and subject-matter assessments are complementary: the former concerns the quality of the instructional product as a medium, whereas the latter concerns the suitability of its educational content.

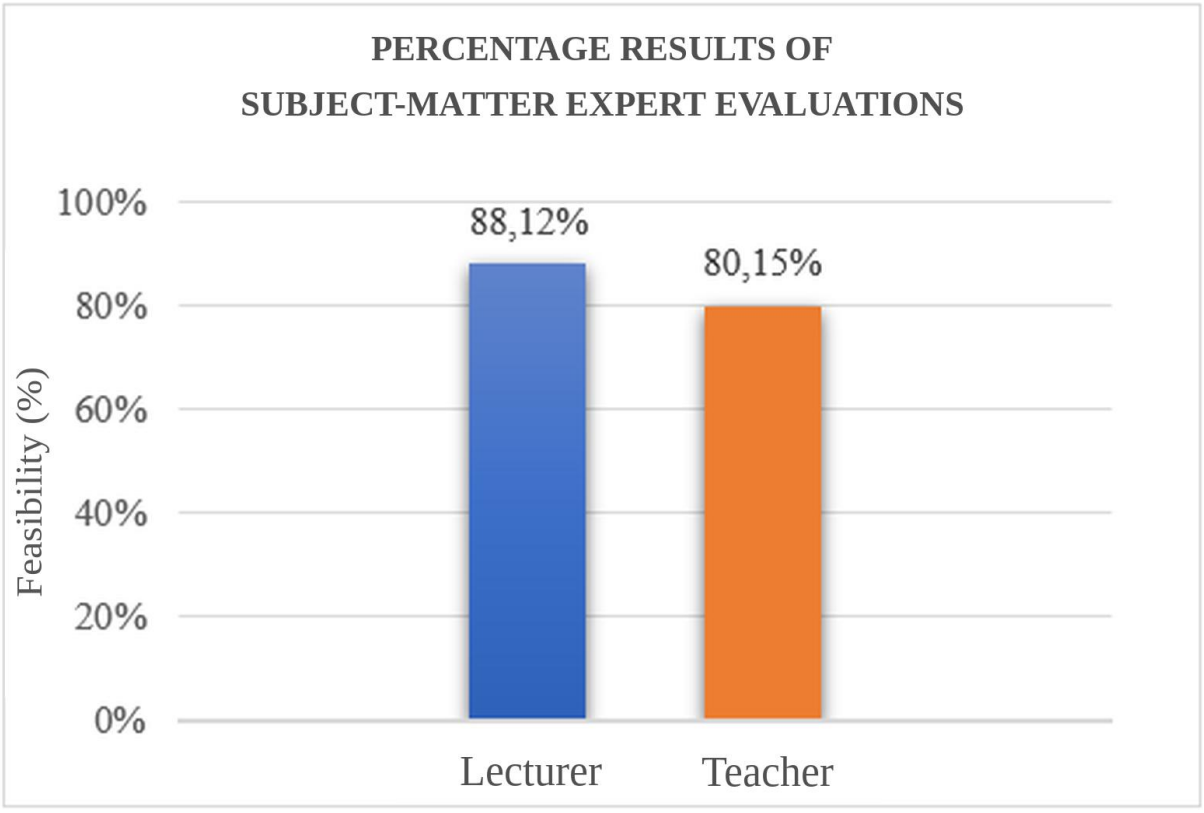


Figure 4. Percentage results of subject-matter expert evaluations

Student Responses to the Module and Worksheets

A product trial was conducted with 33 Grade XI students in the Metal Fabrication and Manufacturing Engineering Department. Students completed separate questionnaires evaluating the Autodesk Inventor CAD

teaching module and the accompanying LKPD. The module responses are displayed in Table 9, and the worksheet responses in Table 10. These responses were used to assess perceived feasibility and suitability, rather than learning achievement.

Table 9. Student evaluation results for the teaching module.

No.	Aspect	Obtained Score	Final Score	Result (%)	Category
1	Content	921	3.48	87%	Highly Feasible
2	Language	330	3.33	83.3%	Highly Feasible
3	Graphic Design	450	3.40	85.22%	Highly Feasible
4	Usefulness	580	3.51	87.87%	Highly Feasible
	Total	**2281**	**3.43**	**85.9%**	**Highly Feasible**

Table 10. Student evaluation results for the student worksheets (LKPD).

No.	Aspect	Obtained Score	Final Score	Result (%)	Category
1	Content	509	3.85	96.25%	Highly Feasible
2	Presentation	729	3.15	78.89%	Highly Feasible
	Total	**1238**	**3.5**	**87.57%**	**Highly Feasible**

Student responses to the teaching module produced a mean score of 3.43 (85.9%), categorized as very good. The LKPD obtained a mean score of 3.50 (87.57%), also indicating a favorable evaluation. The original report additionally presents a combined percentage of 86.73% for the module and worksheets, categorized as highly feasible. Figure 5 shows the original comparison between the two student-response measures. Taken together, these findings suggest that students perceived both resources positively; however, the study did not examine whether use of the module increased CAD competencies.

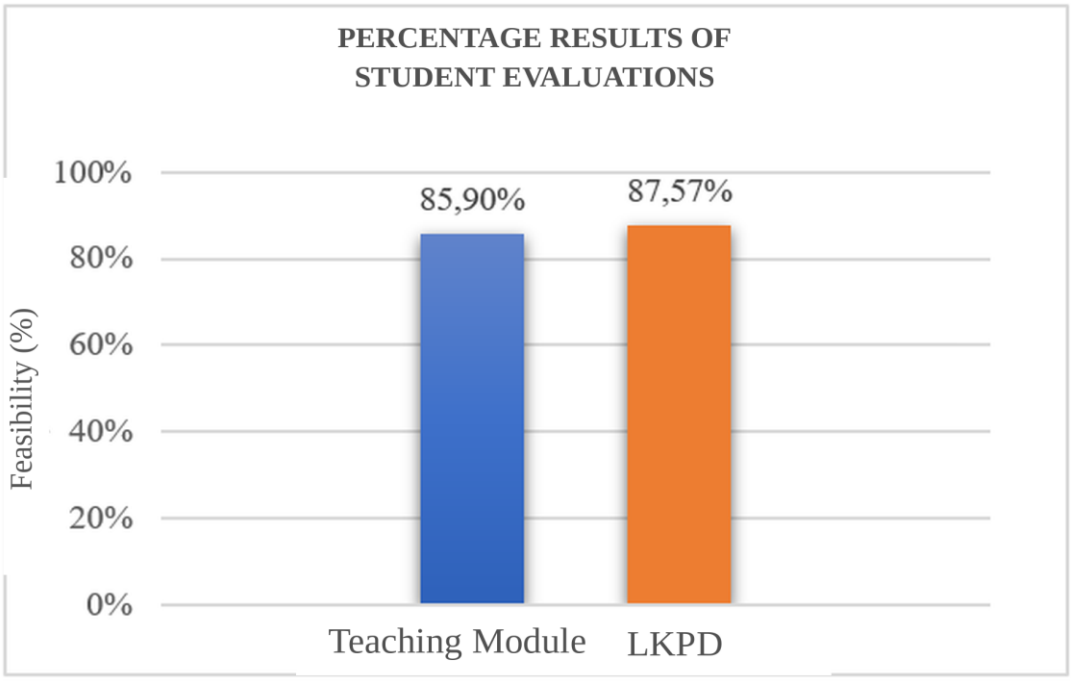


Figure 5. Percentage results of student evaluations of the teaching module and LKPD.

CONCLUSION

This study developed an Autodesk Inventor CAD teaching module containing six instructional units: (1) Introduction to Autodesk Inventor CAD; (2) Sketch Creation; (3) Two-Dimensional Drawing Using a CAD System; (4) Preparation of Engineering Drawings; (5) Three-Dimensional Modeling Using Basic CAD Tools;

and (6) Application of Three-Dimensional CAD to Engineering Design. The content was aligned with the intended learning outcomes and translated into instructional objectives. The product contains general information, core competencies, subject matter, theoretical and practical assignments, assessment guidance, instructional resources, and student worksheets (LKPD).

Expert validation indicated a high level of product feasibility. The media experts assigned an overall mean score of 3.64 (91.49%), while the subject-matter experts assigned a mean score of 3.36 (84.13%). Both percentages fell within the highly feasible category according to the criteria adopted in the study.

The students also responded positively to the developed resources. The teaching module received a mean score of 3.43 (85.9%), categorized as very good, while the LKPD obtained a mean score of 3.50 (87.57%). These results support the feasibility and favorable reception of the developed instructional materials for the target group, without establishing their effectiveness in improving student achievement.

REFERENCES

1. Arikunto, S. (2012). Prosedur penelitian: Suatu pendekatan praktik. PT Rineka Cipta.
2. Aryanto, H., Azizah, M. D., Nuraini, V. A., & Sagita, L. (2021). Inovasi tujuan pendidikan di Indonesia. JIRA: Jurnal Inovasi dan Riset Akademik, 2(10), 1430–1440. https://doi.org/10.47387/jira.v2i10.231
3. Cahayani, A., Widiasari, N., & Gunawan, A. S. (2024). Pembelajaran yang berpusat pada peserta didik melalui program Merdeka Belajar Kampus Merdeka. Jurnal Penelitian Kebijakan Pendidikan, 16(2). https://doi.org/10.24832/jpkp.v16i2.780
4. Depdiknas. (2003). Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional.
5. Difinubun, F. A., Makmuri, M., & Aurelia, H. F. (2022). Analisis kebutuhan modul ajar matematika untuk meningkatkan kemampuan pemecahan masalah siswa SMK kelas X. Griya Journal of Mathematics Education and Application, 2(4), 853–864. https://doi.org/10.29303/griya.v2i4.244
6. Fase F. (2024). CP & ATP: Teknik Fabrikasi Logam dan Manufaktur Fase F. Guru Kemdikbud. https://guru.kemdikbud.go.id/kurikulum/referensipenerapan/capaianpembelajaran/smk/teknik-fabrikasi-logam-dan-manufaktur/fase-f/
7. Friska, F. (2020). Pendidikan karakter dalam kurikulum 2013. Jurnal Pendidikan Anak Usia Dini, 1(1). https://ejournal.kopertais4.or.id/tapalkuda/index.php/CEJ/article/download/3620/2747/
8. Julaeha, S., Muslimin, E., Hadiana, E., & Zaqiah, Q. Y. (2021). Manajemen inovasi kurikulum: Karakteristik dan prosedur pengembangan beberapa inovasi kurikulum. MUNTAZAM: Jurnal Manajemen Pendidikan Islam, 2(1). https://doi.org/10.35706/muntazam.v2i01.5338
9. Kemdikbudristek. (2023). Komponen modul ajar. https://pusatinformasi.kolaborasi.kemdikbud.go.id/hc/enus/articles/5010555-956377
10. Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2022). Keputusan Nomor 009/H/KR/2022 tentang dimensi, elemen, dan subelemen Profil Pelajar Pancasila pada Kurikulum Merdeka.
11. Pemerintah Indonesia. (2003). Undang-Undang Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional.
12. Rindayati, E., Putri, C. A. D., & Damariswara, R. (2022). Kesulitan calon pendidik dalam mengembangkan perangkat pembelajaran pada Kurikulum Merdeka. PTK: Jurnal Tindakan Kelas, 3(1). https://doi.org/10.53624/ptk.v3i1.104
13. Sugiyono. (2013). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.
14. Sugiyono. (2017). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.
15. Sugiyono. (2019). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.
16. Thiagarajan, S., Semmel, D. D., & Semmel, M. I. (1974). Instructional development for training teachers of exceptional children. U.S. Office of Education.