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Introduction to Engineering Drawing and Design: An Open Educational Resource. Integrating AR/VR experiences in first-year engineering graphics courses

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Introduction to Engineering Drawing and Design: An Open Educational Resource Integrating AR/VR experiences in first-year engineering graphics courses

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Abstract:

This paper describes an educational initiative developed as part of the Illinois Support for the Creation of Open Educational Resources (SCOERs) project, facilitated by the Consortium of Academic and Research Libraries in Illinois (CARLI) and funded by a $2 million Open Textbooks Pilot Program grant from the U.S. Department of Education. It is a collaboration between the Department of Civil, Architectural, and Environmental Engineering (CAEE), the Paul V. Galvin Library (Galvin Library), and the Center for Learning Innovation (CLI) at Illinois Institute of Technology (Illinois Tech). Built around a two-part sequence of existing engineering graphics (EG) courses offered annually to first-year civil and architectural engineering students at Illinois Tech, this project has two main objectives:

1. Supporting and enhancing the students' understanding of orthographic projections and spatial visualization skills.
2. Reducing the cost of educational and instructional materials.

The first objective is met by integrating augmented and virtual reality (AR/VR) experiences and fabrication tools, including 3D printing, for hands-on learning in the engineering graphics course sequence. This innovative approach is designed to equip students with unique skills that will be beneficial throughout their education and after graduation as the industry is adopting AR/VR technology.

The second objective is achieved using OERs in the classroom and developing new open-access instructional material. Titled "Introduction to Engineering Drawing and Design", this new OER consists of a series of instructional videos, lecture notes, and exercises. It is articulated in four modules covering fundamental topics in technical drawing and engineering graphics, engineering drawing applications, fabrication tools, and 3D printing. Various drawing and visualization techniques, ranging from hand sketches to computer-based 3D models and AR/VR, are used throughout the resource to respond and adapt to students' different learning styles.

The instructional materials, as developed, are integrated into the courses offered in the academic years 2023 - 2024 and 2024 - 2025, with the OER expected to be completed by the end of August 2025.

This paper outlines the OER's development process, its instructional content, and the expected impacts on engineering students' education. It provides examples of current classroom implementation and student work. Additionally, it discusses the methods the authors are planning to use to assess students' achievement of the learning objectives and the effectiveness of using AR/VR technology on enhancing spatial visualization skills.

By using a Creative Commons License and making modules available beyond our campus community via the LibreTexts portal, this work aims not only to benefit a broader student audience but also to encourage the creation of additional content and research on this topic.

1. Introduction and literature review

Developing the ability to interpret 2D views and visualize 3D objects in space is an essential skill for engineering students. It provides the foundation for more advanced engineering and design courses - such as HVAC design, surveying, construction cost estimating, structural and architectural design - and it is critical to students' academic success and their future careers as engineers.

Engineering graphics courses are generally offered in undergraduate programs in engineering. In a typical engineering graphics course, students learn the fundamentals of technical drawing and methods of illustrating parts, products, systems, or structures into 2D projections and 3D drawings that are readily understandable and usable by personnel involved in the process of manufacturing and construction. Topics and exercises covered in engineering graphics courses include line types, units and scale, sketching, computer-aided drafting, orthographic projections and multiview drawings, isometric and oblique projections, and engineering drawing applications, such as understanding construction documents.

This project is based on an existing two-part sequence of engineering graphics courses (CAE 100/CAE 101) offered to first-year students entering architectural and civil engineering majors at Illinois Institute of Technology. The first part of the sequence (CAE 100), typically offered in the fall semester, focuses on the principles of technical drawing and traditional hand drafting, and sketching. In the spring students learn computer-aided drawing tools, specifically AutoCAD 2D and 3D, SketchUp, and Revit. Additionally, they are exposed to fabrication tools such as laser cutting and 3D printing.

Students enter the engineering graphics sequence with varied levels of drawing and visualization skills. Figure 1 shows an example of an engineering graphic exercise that was assigned in a quiz during the first part of the course sequence. Students were provided with the complete top and front views of an object and were required to draw the right-side view using the information given. Most students were not able to identify the hidden edge on the right-side view and represented a visible edge instead, highlighted in red in figure 1. Even after examining an isometric sketch of this object, students had difficulties locating that

edge and imagining the object in three dimensions. Understanding the relationship between 2D projections and the object in 3D can be challenging for students due to the limitations provided by the two-dimensional nature of paper.

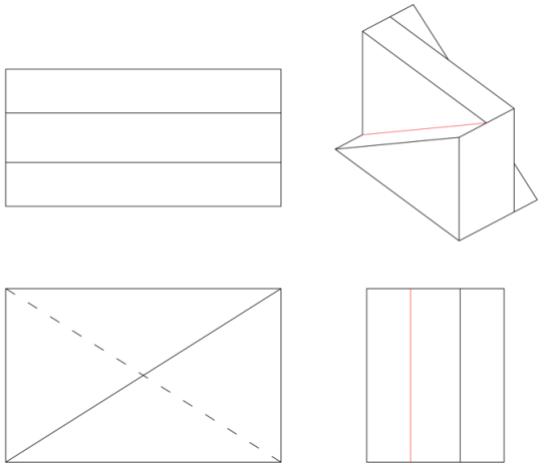

Figure 1: Example of student submission

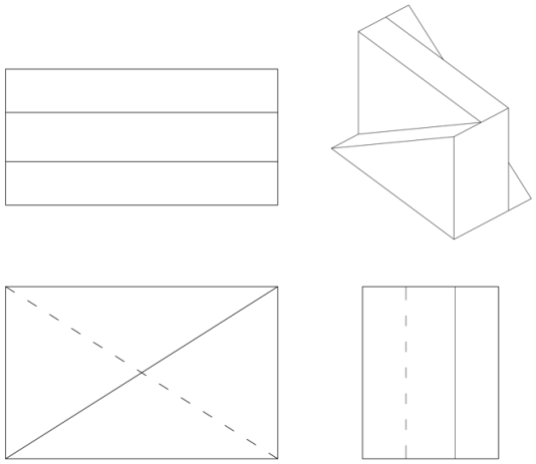

Figure 2: Correct exercise

To address this challenge and enhance spatial visualization skills, this project plans to introduce different visualization and fabrication tools in the engineering graphics course sequence. It is believed that integrating augmented and virtual reality (AR/VR) experiences, along with traditional sketching and computer-based 3D modeling, can facilitate and support the diverse learning styles of different students. Furthermore, exposing students to advanced technologies aligns the engineering graphics curriculum with the latest industry practices and prepares students for more advanced courses and topics.

The implementation of modern technologies has become popular to improve learner outcomes in engineering graphics courses. In addition to using graphics software, instructors have also resorted to other means such as AR and VR technologies, see for example, Miller (1999), Strong and Smith (2001), Chen et al (2011), and Veide et al (2014). As educational tools, AR/VR platforms support students' visualization skills, facilitating the understanding of the object in three dimensions and the relationship to two-dimensional projections. The implementation of AR/VR technologies provides students with a spatial experience that can't be replicated on paper and adds a new layer of instruction to meet the diverse learning needs of students.

The specific application of AR/VR in various courses, especially in STEM areas, has been widely covered in literature as outlined in Tene et al (2024). Some limited published studies (as cited earlier) have specifically addressed the application of these technologies in engineering graphics courses in general and first-year engineering graphics courses in particular.

The use of fabrication tools such as laser cutting and 3D printing, already covered in the course sequence, complements the students' experience with AR/VR technology providing the link between visualization, representation, and fabrication. Illustrated below is an example of a 3D printing assignment. This project was a result of individual and collaborative work. Students were provided with construction document sets of the university's campus historical buildings. They were tasked to prepare 2D drawings and 3D digital models of the assigned buildings (figure 3) and build a physical model of the campus using a laser cutting machine and 3D printer, as shown in figures 4 and 5. This exercise demonstrated the students' understanding of construction documents, their drawing skills, and their ability to transition from the virtual representation to the fabrication of a physical object.

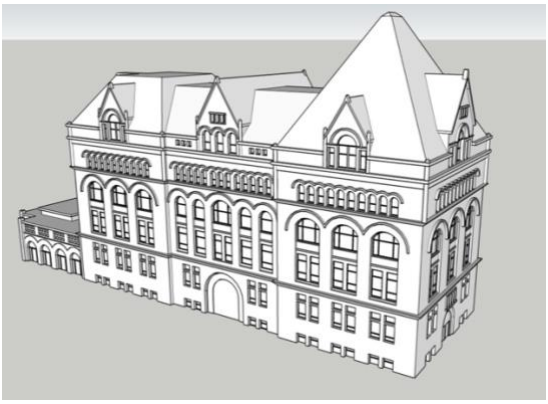

Figure 3: Example of SketchUp 3D model of Illinois Tech's Main Building

Figure 4: Picture of 3D printed model

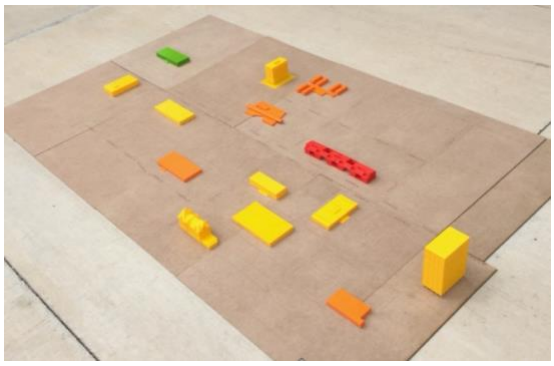

Figure 5: Picture of the campus model

In addition to exploring the integration of VR/AR technology in the engineering graphics curriculum and introducing 3D printing, this project aims to promote the use of open educational resources through a collaboration with the university library. We believe this extra step will further enrich the students' learning experiences, introducing students to OERs and reducing the cost of educational and instructional material. Furthermore, publications resulting from this research will add to the current state-of-the-art

literature in AR/VR applications with an added dimension of providing data on the significance of OER use in the classroom.

One of the project's objectives consists of creating an open-access educational resource (OER) based on this material and aligned with the course curriculum. Additionally, supplemental materials used in class are also selected among existing open educational resources. It was observed that students are often unaware of the existence of OERs. Through this work, the authors aim to introduce students to these freely accessible resources and encourage them to explore and utilize these materials in their courses.

It is expected that the use of AR/VR technology and OER will benefit the students' learning experience in several ways: (a) It will better prepare them for upper-level courses especially in design, (b) It will support and enhance the students' understanding of orthographic views and their spatial visualization ability, (c) It will provide students with unique skills that will serve them throughout their education and after graduation as the industry is adopting AR/VR technology, (d) The use of OER will help reduce the cost of educational and instructional materials.

2. Methodology and timeline

The work is achieved in three phases: (1) Preparation and planning, (2) Implementation, and (3) Results evaluation as illustrated in figure 6. The timeline and project phases were determined by the grant requirements, which included integrating the developed material in the classroom for at least two semesters.

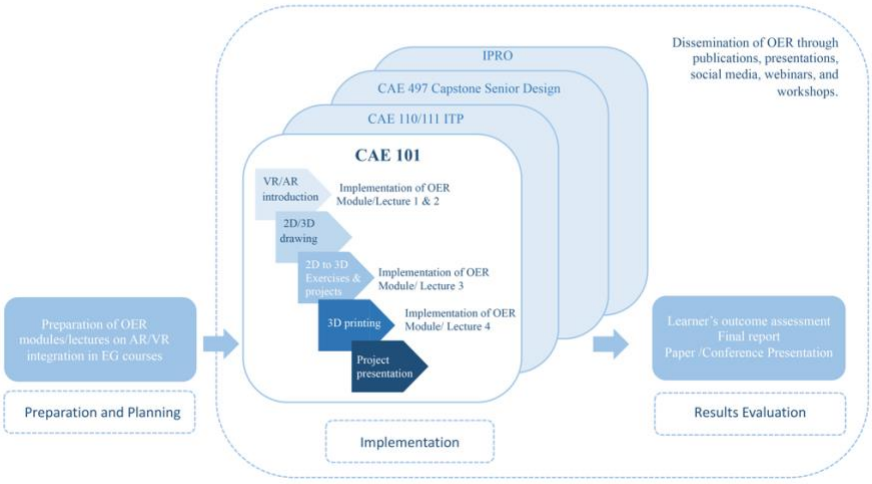

Figure 6: Three project development phases

Phase 1: Preparation and planning. Phase 1 started in March 2023 and was devoted to the initial planning among research team members to (a) lay out the implementation of the OER experience and AR/VR technology in the classroom, (b) prepare instructional materials for students, and (c) understand equipment needs for the project and classroom. During this phase the research team identified existing OER resources that could be used in class and explored different approaches for the creation of new OER material to supplement existing resources. Examples of already available open educational resources that cover technical drawing and engineering graphics, computer-aided design and 3D printing, and AR/VR technology as an educational tool, include for instance Basic Blueprint Reading, Tutorials of Visual Graphic Communication Programs for Interior Design, and Building Information Modeling using Revit for Architects and Engineers.

However, while these resources can be readily implemented in a classroom, they are not connected to each other and some of the material does not relate to engineering. This project aims to create new lectures and educational modules that specifically target engineering students. The modules/lectures of this series are aligned with the structure of the revised curriculum of the engineering graphics course sequence, and they are designed to build on each other to facilitate students' understanding of the links between technical drawing, engineering design, computer-aided drawing, visualization, and fabrication tools.

Phase 2: Implementation. Phase 2 of the project began in January 2024 and involved implementing the developed educational materials in one section of the engineering graphics sequence during the Fall 2023, Spring 2024, and Fall 2024 semesters. This integration continued throughout the Spring 2025, with new educational materials being continuously developed and introduced in the classroom as the courses progressed.

Phase 3: Results evaluation. In phase 3, student learning outcomes are assessed through specific performance indicators that are related to the course learning outcomes, including (a) the understanding of the principles of technical drawing and standards, (b) the ability to use computer-aided drafting tools, (c) the ability to use 3D printing for class projects, and (d) verbal and graphic presentation skills. One way to evaluate the program's success is to assess the impact of AR/VR use in the classroom by evaluating students' engineering graphics skills before and after their exposure to AR/VR. Additionally, the sponsoring agency is requiring students and faculty to complete a survey at the end of each semester to assess the impact of the OER on the students' learning outcomes.

3. Open educational resource (OER) outline and implementation

This project is a collaboration between the Department of Civil, Architectural, and Environmental Engineering (CAEE), the Galvin Library, and the Center for Learning Innovation (CLI) at Illinois Tech.

CAEE provides subject matter expertise; staff at the Galvin Library support and promote the research team's efforts to develop and distribute OERs that positively impact the education and finances of students and, additionally, the Galvin Library's Exploration Space has provided 3D printing support for the students enrolled in the current semester's engineering graphics course; lastly the Center for Learning Innovation has provided advice with best practices to develop video lectures and will support the project in the evaluation and assessment phase.

The OER "Introduction to Engineering Drawing and Design" is organized in four modules. Modules A, B, and C focus on topics covered in traditional engineering graphics courses, including line types, units and scale, geometric constructions, system of projections, and parallel projections. Module D focuses on drawing applications and fabrication using the 3D printer. It is expected that it will be fully available to a broad audience by the end of August 2025. Table 1 outlines the four modules and topics in each module.

Module	Topics
Module A	Course overview and introduction to engineering graphics
	Line types
	Units and scale
	Drawing tools and geometric constructions
	System of projections
Module B	Orthographic projections
	Multiview drawings
	Hidden lines and curved surfaces in multiview drawings
	Normal, inclined, and oblique surfaces
	Auxiliary views
Module C	Section views
	Axonometric drawings
	Oblique drawings
Module D	Drawing applications
	3D printing

Table 1: Open Educational Resource "Introduction to Engineering Drawing and Design" Outline

As an online resource, the OER has the potential to be more dynamic compared to a traditional book and it is designed to incorporate a variety of teaching tools to address a broad audience and enhance learning. In addition to lecture notes, this OER is expected to include short video lectures and supplemental

material such as drawing exercises. In addition, various drawing and visualization techniques, ranging from hand sketches to computer-based 3D models and AR/VR, are used throughout the resource.
The video lectures created for the different OER topics are 5-10 minutes long and consist of three parts: (a) an introduction to the module/topic including a list of learning objectives for the lecture, (b) the lecture, and (c) references and credits.

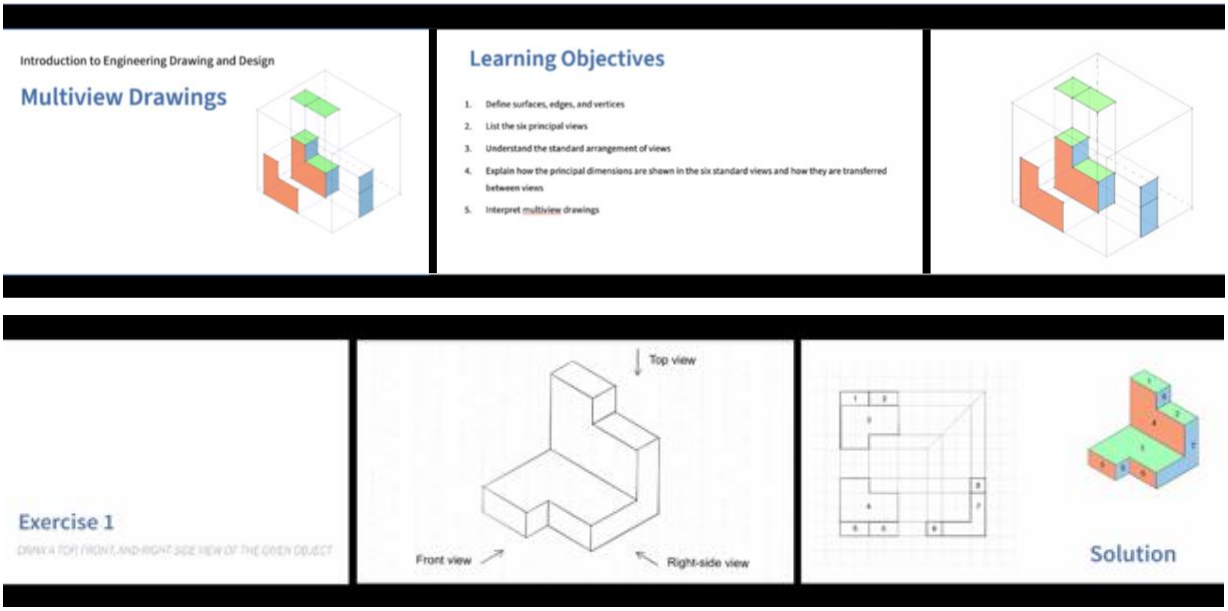

Figure 7: Screenshots from various parts of a video lecture focusing on orthographic projections

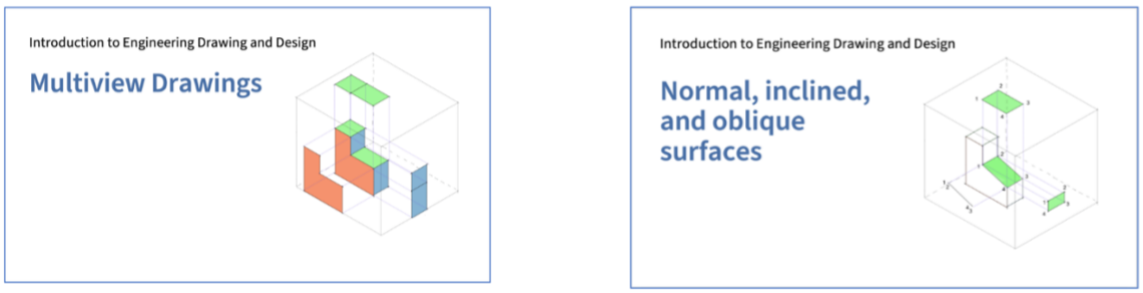

Figure 8: Sample cover pages of different lectures of Module B

Currently in the implementation phase, this material has been progressively introduced in the classroom since Fall 2023. To align with the OER's structure, the course Canvas page for the Fall 2024 semester was organized around the four modules. New instructional material is continuously being developed during the semester, while the course is offered. This process allows us to test the educational material in class and receive feedback from the students. For instance, during the fall semester it was observed that

alongside videos explaining the theory of technical drawing, lectures demonstrating step-by-step solutions to drawing problems further assisted the students' learning process.

4. Integration of fabrication tools and AR/VR technology in the classroom

The integration of fabrication tools, specifically 3D printing, is a central element of the project and is a required component by the sponsoring agency. The existing course sequence already included a module on 3D printing and fabrication. In the Spring 2024 semester, 3D printing was incorporated as part of the students' final project deliverable. Students worked in teams of two and were tasked with the design and printing of a unique chess set. The midterm project focused on design and tasked students with ideating a concept or main theme that would inform the design of their chess set. Additionally, students had to use the drawing software learned in class to create 2D views and 3D models of their project. A continuation of the midterm project, the final project required student teams to 3D print a minimum of four of the six different chess pieces. In this process, teams had to revise their drawings to address the fabrication method. The limitation to four 3D printed pieces per team was due to the time required for 3D printing, the number of teams, and the printing capacity and resources of the Galvin Library's fabrication space. The same project was offered in the Spring 2025 semester. Typically, two to three sections of engineering graphics are offered in the spring semester. However, this year the sections were combined into one larger class with 43 enrolled students. Despite the larger class size, lessons learned from the previous year helped streamline the process, enabling 17 teams of two to three students to 3D print all six different chess pieces.

The images below illustrate one of the students' projects at the end of the Spring 2024 semester. The team's design was based on a fairy tale theme, with each chess piece featuring different attributes of fairy tale characters. After learning about 3D printing, the students observed that there was a lot of plastic waste associated with this fabrication process. In fact, 3D printers create support structures for objects that have overhanging elements or complex geometries that are not touching the printing plate. The support structure can be removed from the final project and disposed of at the end of the 3D printing process. To promote a more sustainable fabrication method, the students decided to break down their pieces into smaller parts that could be printed without the need of support structures as illustrated in figures 10 and 11. These parts were then assembled to form the final pieces.

Figure 9: Five pieces of the 3D printed Fairy Tale chess set

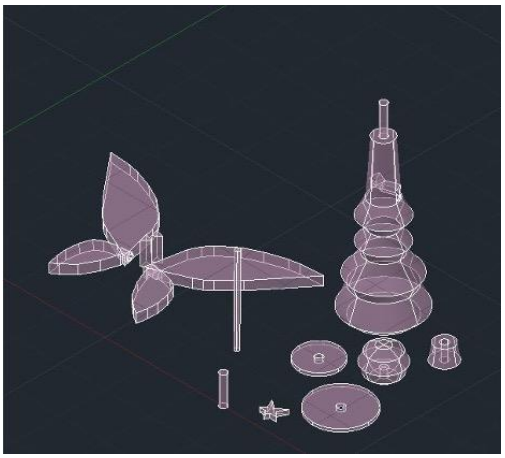

Figure 10: 3D model of the parts of a chess piece prepared for 3D printing

Figure 11: 3D printing process of different components

The research team is planning to include in the OER a sample project for 3D printing and a set of instructions on how to utilize and maintain a 3D printer. Once released, it is expected that this material can support students but also instructors interested in learning more about 3D printing.

In the spring semester, students registered in the engineering graphics sequence were also exposed to augmented reality (AR) and virtual reality (VR). Augmented reality is a technology that enhances the real world by adding computer-generated drawings or information onto the physical environment. An exercise

focusing on augmented reality was introduced in the Spring 2025 engineering graphics course. To assess the effectiveness of augmented reality in enhancing students' understanding of orthographic projections and 3D visualization skills, students were provided with completed top, front and right-side views of an object including a combination of normal, inclined and oblique surfaces, and were asked to draw an isometric sketch of the given object[1]. After their first attempt, students were given a QR code linking to an AR visualization of the same object and were asked to repeat the exercise, identify any mistakes in their initial attempt, and correct them. SketchUp was used to draw the 3D assets for the augmented reality exercise and Adobe Aero has been used to create the augmented reality visualizations and produce the QR codes. The generated QR codes are open access and can be scanned and visualized by anyone using a phone. Below are examples of students' solutions. These attempts show how students who struggled interpreting the orthographic views were able to understand the given views and complete the isometric sketch.

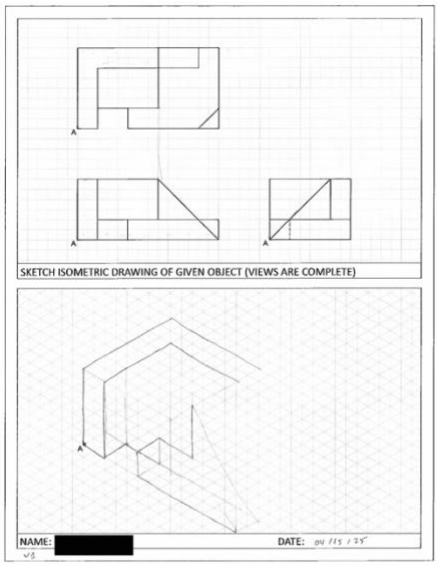

Figure 12: Exercise example 1. Student's first attempt at solving the exercise

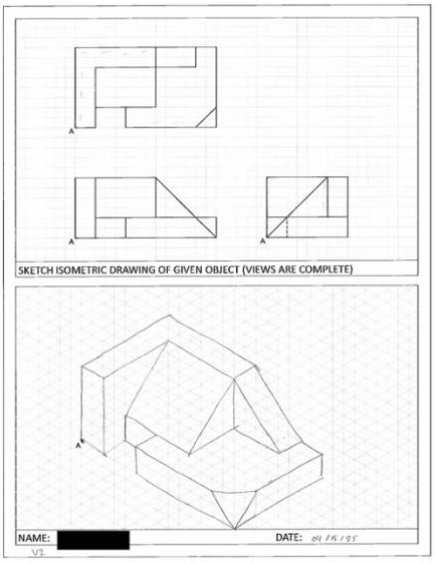

Figure 13: Exercise example 1. Student's second attempt following AR visualization

[1] The geometry of this object is based on Giesecke et al. (1999), sheet 28, exercise 1.

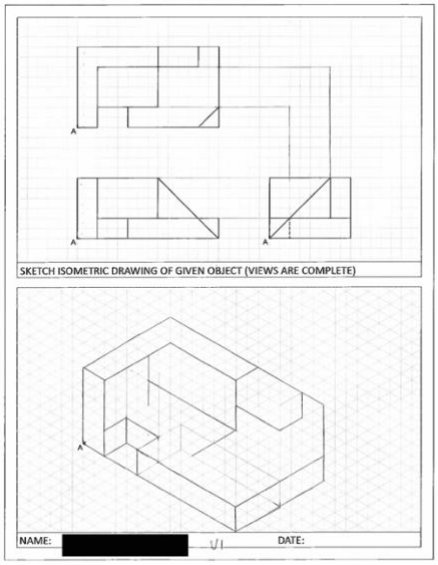

Figure 14: Exercise example 2. Student's first attempt at solving the exercise

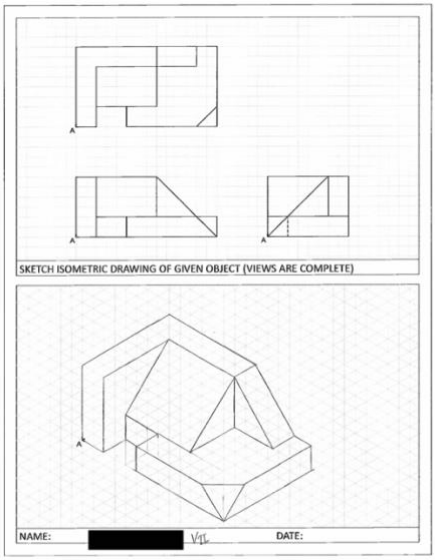

Figure 15: Exercise example 2. Student's second attempt following AR visualization

Figure 16: Augmented Reality (AR) visualization of the object analyzed in the exercise

Adobe Aero is an intuitive tool for creating AR visualizations. However, one limitation is that it is not all Android devices are supported. Students with iPhones or other Apple devices were able to access the AR content without any issues, while those with Android phones were generally unable to view it. Further research could explore alternative tools that offer broader device compatibility. Additionally, providing an

iPad for in-class use could help ensure all students can access the AR visualizations regardless of their personal devices.

During the same semester, students were also exposed to virtual reality. Virtual Reality provides an immersive experience in a digitally created environment. The research team purchased four Meta Quest 3 headsets to be used in the classroom for a virtual reality workshop. In the spring semester, students learn different drawing software including AutoCAD 2D and 3D, SketchUp, and Revit. The virtual reality workshop was designed to take place after the Revit sessions. Autodesk Workshop XR was used for the VR experience and Revit's sample building was used as the asset. Originally, the project involved using the students' Revit assignments as the VR assets, to provide students with an immersive experience of their own design. However, since Revit has a steeper learning curve compared to other drawing software, additional time should be allocated between the Revit lectures and the VR workshop to ensure students have sufficient time to complete their assignments. Additionally, Autodesk Workshop XR is not a free tool and does not offer an educational version. Future research includes exploring alternative open-access tools.

5. Results and Assessment

The material covered in modules A, B, and C has been offered in the first part of the engineering graphics sequence in the Fall 2023 and 2024 semesters. Prior to Fall 2023, students were required to purchase two books: a subject matter book and an exercise book. The total cost of these two books, if purchased new, was approximately $151, including $108 for the textbook's latest edition and $43 for the exercise book (as found on Amazon). In the Fall 2023, the newly created open material was partially included, and the textbook requirements were reduced to the exercise book only. In the Fall 2024, the course did not require any textbook, eliminating the cost associated with instructional material. Suggested readings included an existing OER that discussed several topics aligned with the course outline, Basic Blueprint Reading, Copyright © 2019 by Linn-Benton Community College.

Additionally, lectures in the form of PowerPoint presentations and short video recordings, which will become parts of the final OER developed by the authors, were offered to students on Canvas. On a typical year, the incoming first-year class ranges from 35 to 60 students. To accommodate the incoming class, two to three sections of the engineering graphics sequence are offered in the fall and spring semesters. So far, the material has been offered to one engineering graphics section in Fall 2023 (18 students), Spring 2024 (27 students), and Fall 2024 (18 students). In the Spring 2025, the three sections have been merged into one larger class with 43 students registered. Once completed, the project has the potential to expand to other engineering courses including, for example, Introduction to the Profession, and the Capstone Senior Design class, as well as design courses offered in various departments.

At the end of Fall 2024 semester, the sponsoring agency distributed a survey investigating the students' use of the OER in class and the impact of the OER on the learning outcomes. A total of 14 students out of 18 students, participated to the survey. The table below summarizes the survey questions and results.

Survey Statement/question	Response options	Results (CAE 100, Fall 2024)
1. Please indicate below that you agree to participate in this survey.	Yes/No	Yes 100%/No 0%
2. Were you 18 years of age or older when your Fall 2023 term began?	Yes/No	Yes 100%/No 0%
3. Select your institution's name	Names of participating Institution	Illinois Institute of Technology
4. Please provide the name of this course [for example: BIS 130, Introduction to Photography, or Anatomy for the Health Sciences (ANT152)	Open section	CAE 100 Introduction to Engineering Drawing and Design
5. What types of free resources did this course use?(check all that apply)	Open Textbook Open Workbook or Lab book 3D Printing assignment Other	Open Textbook 79% Open Workbook or Lab book 43% 3D Printing assignment 14% Other 21%
6. Did you pay for any required materials for this course?	Yes/No	Yes 57%/No 0%
6a. If you answered yes to question 6, what did you purchase?	Open section	Drawing Tools
6b. If you answered yes to question 6, how much did you spend?	Open section	Average of $60
7. How do the course materials used in this class compare to purchased textbooks you have used in other college level courses?	The quality does not seem as good I am not sure The quality seems the same The quality seems better	The quality does not seem as good I am not sure 7% The quality seems the same 57% The quality seems better 36%
8. Did the course materials impact your learning for this course?	Not at all They were moderately helpful They have definitely helped with my learning	Not at all They were moderately helpful 21% They have definitely helped with my learning 79%
9. When did you first access the course materials?	Never During the 1st week The 1st day of class Prior to beginning of class Other	Never 0% During the 1st week 64 % The 1st day of class 21% Prior to beginning of class 7% Other 7%
10. How often did you use the materials in this course?	Never Only before an exam Less than once a week At least once a week Daily	Never 0% Only before an exam 14% Less than once a week 29% At least once a week 43% Daily 14%

11. How does this compare to traditional textbooks you have used in other courses?	Less often The same More often	Less often 7% The same 64% More often 29%
12. Did having course materials that were freely available make a difference in your overall performance in the course?	No I am not sure Yes	No 7% I am not sure 14% Yes 79%
13. Did having course materials that were freely available make a difference in your study habits?	No I am not sure Yes	No 7% I am not sure 29% Yes 64%
14. Did having course materials that were freely available make a difference in your mastery of the subject area?	No I am not sure Yes	No 14% I am not sure 21% Yes 64%
15. What did you like about the materials used in this course?	Open section	Interactive Easy access They were hands on Not much; they were simple to use though. They were easy to access and provided information straight to the point and useful They were comprehensive and easy to understand. The videos were very insightful because they went into further depth about the vocabulary and terms as well as showing the proper method of doing the required assignment. The material was explained concisely in a short amount of time and was made understandable at a basic level without the student needing to look up terminology. There is a certainty that they will come in handy in the future and may last me a long time. I like how easily they can be accessed.
16. How might the course materials be improved?	Open section	Maybe a more online component. NA I wish there were cheaper, more affordable options. I believe the videos could benefit from going at a quicker pace. I also believe consolidating information into less material can benefit so things can be straight to the point. By covering more concepts and including a variety of examples Maybe more examples can be provided of how to do a certain assignment. There were some parts during homework, such as Sectioning, that I had trouble with and tried to look up similar problems. There could be more videos about other topics, and the geometry

		drawing videos could be more in-depth in explaining how to find a circle that is tangent to two other different circles.
17. Have you ever dropped, failed, or withdrawn from a course because of the cost of the textbooks?	Yes/No	Yes 0%/No 100%

Table 2: Fall 2024 end of semester survey results

The results of the Fall 2024 end-of-semester survey highlight the effectiveness of the newly developed OER in supporting students' overall performance in the course. Students particularly liked the addition of video lectures to supplement in-class instruction, the short, easy-to-process format of the recordings, and the interactivity and accessibility of the materials. Feedback includes adding more video lectures, with a focus on topics such as sectioning and tangencies. The survey also confirmed that students did not incur any additional expenses beyond the purchase of required drawing tools. 3D printing was not included in the fall semester but is integrated into the spring semester's portion of the course sequence. The same survey will be shared with students enrolled in the Spring 2025 semester.

Furthermore, based on the course experience and the comments shared by students in class, the research team concluded that integrating augmented reality (AR) can be particularly beneficial in the first part of the Engineering Graphics sequence, when students are introduced to the principles of technical drawing and orthographic projections. Virtual reality (VR), on the other hand, appears to be more effective for developing spatial understanding of floor plans and sections. It is therefore better suited for integration into the second half of the sequence, when the focus shifts to computer-aided design (CAD). This exercise also provides an opportunity to bridge the gap between the drawing software students learn during the semester and spatial visualization techniques. For example, by the end of the course, students are able to create their own AR and VR assets.

Students are also exposed to fabrication tools including laser cutting and 3D printing, helping them to understand the relationship between drawing and fabricating, and how different tools require different drawing inputs and designs.

6. Conclusion

The ability to understand and produce technical drawings and develop 3D visualization skills is critical for engineering students. These skills are introduced in the undergraduate engineering curriculum through engineering graphics courses. This project aims to impact students in three ways: (a) supporting the development of 3D visualization skills, (b) modernizing the engineering graphics curriculum to include

AR/VR experiences and 3D printing, and (c) expanding access to education by reducing the cost of instructional material.

Creating diverse learning tools, including videos, written lecture notes, and practical drawing exercises, can address different learning styles. Furthermore, modernizing engineering graphics classes through the integration of advanced technologies such as AR/VR and 3D printing supports the learning process and prepares students for the latest advances in the industry. Lastly, this project aims to expand access to education by creating open-access materials. The Creative Commons license allows for the material to be revisited and modified, fostering the potential for further research in this field. Currently in progress, this project is expected to be complete and broadly available by the end of August 2025.

Future work will focus on expanding the resource through additional research into open-access AR/VR tools and the development of new exercises that further support student learning. the dynamic and flexible format of the Open Educational Resource allows for continuous updates and the integration of new chapters and content ensuring that the material remains current.

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