ETHIOPIAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

DEVELOPING POLYTECHNIC KNOWLEDGE THROUGH TEACHING STUDENTS TO READ AND CREATE ASSEMBLY DRAWINGS

Gulora Khamidjon qizi Ollaberganova

Lecturer at the Department of Art Studies, Urgench State Pedagogical Institute

Annotation: This article discusses methods and strategies to develop students' polytechnic knowledge through teaching them how to read and construct assembly drawings. It emphasizes the importance of integrating theoretical and practical learning in technical education, particularly in drawing lessons. By enhancing students' spatial imagination and technical understanding, this approach contributes to their overall scientific and engineering competencies. The article presents pedagogical techniques, task examples, and the significance of interdisciplinary teaching in improving students' abilities in interpreting and performing complex graphical tasks.

Keywords: Assembly drawings, polytechnic knowledge, technical education, graphical literacy, engineering drawing, spatial imagination, STEM education, teaching methods, practical skills, interdisciplinary learning.

Nowadays, the rapid advancement of science and technology demands that education systems equip students not only with theoretical knowledge but also with the ability to apply that knowledge in practice. In technical and vocational schools, one of the most effective ways to achieve this is by developing students' polytechnic knowledge. This refers to the integrated understanding of science, technology, and industry, and how they relate to real-life engineering problems.

One of the core components in developing polytechnic knowledge is the mastery of assembly drawings. These are detailed technical illustrations that show how different parts fit together to form a whole machine or device. Reading and creating such drawings requires students to understand dimensions, scales, projections, materials, and functional relationships between parts.

This article aims to explore how students can be taught to read and complete assembly drawings effectively, and how this process enhances their overall polytechnic knowledge. The integration of theoretical drawing principles with practical application tasks not only improves their technical drawing skills but also strengthens their problem-solving abilities and understanding of mechanical systems.

Assembly drawings are more than just technical illustrations; they are a bridge between design and production. These drawings help students understand:

- How parts fit and work together
- How to visualize mechanical motion and connections
- The principles of design, tolerances, and safety
- The importance of precision and standardization in industry.

In polytechnic education, these skills are essential for developing future technicians, engineers, and inventors. When students learn how to read and create assembly drawings, they begin to think like engineers—analytically and systematically.

Key educational outcomes of teaching assembly drawings include:

- Improved understanding of geometry and spatial reasoning

eISSN: 2349-5715 pISSN: 2349-5707
Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

- Development of fine motor skills and accuracy
- Familiarity with industry standards (like ISO, GOST)
- Enhanced creativity in technical problem-solving

Pedagogical Approaches to Teaching Assembly Drawings

Effective teaching strategies must combine theory, practice, and motivation. Some key approaches include:

Step-by-step analysis- break down the process of reading or drawing into stages. Start with identifying basic shapes, then move to dimensions, views, and eventually the complete assembly.

Visualization training- encourage students to use 3D models, digital tools (like AutoCAD or SolidWorks), or even simple paper models to see how parts connect. Visualization helps bridge the gap between 2D and 3D understanding.

Integration with physics and math- relate drawing tasks to subjects like physics (forces, motion) and math (geometry, measurement). This reinforces polytechnic knowledge through interdisciplinary learning.

Project-based learning- assign students real-life projects, like designing a bicycle brake or a simple gearbox. Let them create all necessary drawings, starting from individual parts to the final assembly.

The Structure of Assembly Drawings: Concepts and Components

To effectively teach students how to work with assembly drawings, it is important that they understand the standard structure and components of these drawings. An assembly drawing usually contains the following elements:

a) Main View

These are front, top, and side views showing how all parts come together. These views use orthographic projection and must be arranged according to technical drawing standards.

b) Sectional Views

These are used to show the inner parts of an assembly that are not visible from the outside. Students must learn how to interpret and create sectional views using cutting planes.

c) Parts List (BOM – Bill of Materials

This table includes names, quantities, materials, and designations of all parts used in the assembly. Understanding the parts list is essential for interpreting the drawing and planning production.

d) Balloons and Item Numbers

Each part is usually marked with a numbered balloon connected to the BOM. Students must learn how to match each component to its location and purpose.

Challenges Students Face in Learning Assembly Drawings

While teaching this subject, educators must be aware of common difficulties students may encounter:

- Lack of spatial imagination – Students often struggle to mentally rotate or visualize 3D objects from 2D views.
- Difficulty reading complex drawings – Beginners may find assembly drawings overwhelming due to the number of parts and views.
- Misunderstanding projection rules – Without a solid grasp of orthographic projection, students may misinterpret the positions and relationships of parts.
- Weakness in technical vocabulary – Many students do not know terms like “thread,” “key slot,” or “clearance hole,” which are common in mechanical drawings.
- Limited practical experience – If students have never seen or touched real mechanical parts, they may find it difficult to relate drawings to real objects.

To overcome the above challenges, instructors can adopt the following techniques:

Bring mechanical kits or real machine parts to class so students can touch and assemble them. Connecting drawings to physical reality increases understanding. Use CAD software (e.g., AutoCAD,

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

SolidWorks) to demonstrate 3D views, exploded assemblies, and animations. Students can manipulate digital models and understand connections better. Before using computers, students should learn to hand-sketch parts and assemblies. This improves observation, spatial reasoning, and drawing discipline. Allow students to work in teams. Discussing assembly drawings and solving tasks together improves communication and critical thinking.

To reinforce learning, students should complete both theoretical and practical exercises. Here are a few sample tasks:

Evaluation should be based on both accuracy and creativity. Teachers can assess students in the following areas:

- Technical correctness: Are the dimensions, views, and alignments correct?
- Understanding of function: Do students grasp how the parts work together?
- Use of standards: Are drawings labeled correctly? Is the parts list accurate?
- Presentation quality: Are the drawings clean, legible, and professional?
- Software use (if applicable): Do students use CAD tools efficiently?

In conclusion, teaching students to read and create assembly drawings plays a crucial role in the development of their polytechnic knowledge. It not only enhances their ability to understand complex technical systems but also strengthens their spatial reasoning, problem-solving skills, and overall engineering mindset. By integrating theoretical concepts with practical application, students are better prepared to meet the demands of modern technical and industrial environments.

This approach fosters interdisciplinary learning, encourages analytical thinking, and equips learners with the skills necessary for future careers in engineering, manufacturing, and design. Therefore, incorporating assembly drawing instruction into technical education is not just beneficial—it is essential for cultivating a new generation of skilled, innovative, and competent professionals.

References:

1. Abdukarimov, A. (2019). Engineering Graphics and Descriptive Geometry: Textbook for Technical Colleges. Tashkent: Fan va Texnologiya.Ro‘ziyev, E.I., Ashirbayev, A.O. Methods of Teaching Drawing in General and Vocational Schools [Textbook]. – Tashkent: Bookmany Print, 2023. – 238 pages.
2. Xolboev, A., & Islomov, A. (2020). Methods of Teaching Technical Drawing in Vocational Education. Tashkent: TDPU Publishing House.Ro‘ziyev, E.I., Ashirbayev, A.O. Methods of Teaching Drawing in General and Vocational Schools [Textbook]. – Tashkent: Bookmany Print, 2023. – 238 pages.
3. Ro‘ziyev, E., Ollaberganova, G. Improving the Content of Topics Related to Assemblies in the School Drawing Curriculum. Modern Science and Education (Scientific-methodological collection), 2024, Issue 1, pp. 55–62.
4. Ro‘ziyev, E.I., Ashirbayev, A.O. Methods of Teaching Drawing in General and Vocational Schools [Textbook]. – Tashkent: Bookmany Print, 2023. – 238 pages.
5. Ro‘ziyev, E.I., Latipov, R.A. Drawing and Graphics. Grade 9 (Textbook for general secondary schools). – Tashkent: "Nodirabegim" Publishing House, 2021. – 120 pages.
6. Tursunov, B. (2015). Pedagogical Approaches to the Development of Polytechnic Knowledge in Secondary Schools. Tashkent: Fan.