36 TYPE HOUSE DESIGN TRAINING USING AUTOCAD AND SKETCHUP – SRICHIWAN WITTAYA SCHOOL, YALA , THAILAND

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ABSTRACT

*The rapid development of digital technology has significantly transformed the field of architectural design, requiring students and future professionals to master advanced digital tools for technical drawing and three-dimensional visualization. This community service program, titled "36 Type House Design Training Using AutoCAD and SketchUp", was conducted at **Srichiwan Wittaya School, Yala, Thailand**, with the primary objective of improving students' competencies in architectural design. The training was structured into theoretical sessions and practical workshops, focusing on essential drafting skills, spatial planning, and 3D modeling techniques. Participants learned to create complete architectural drawings — including floor plans, elevations, and sections — using AutoCAD, and subsequently developed three-dimensional models using SketchUp. The results showed significant improvements in participants' technical skills, design understanding, and problem-solving abilities. Moreover, the program fostered digital literacy, creativity, and collaborative learning among students, providing them with a strong foundation for future studies and careers in architecture and related fields. This initiative also strengthened academic cooperation between Indonesian higher education institutions and Thai educational partners, highlighting the importance of cross-border collaboration in community-based educational development.*

Keywords: *AutoCAD; SketchUp; Architectural Design; Community Service; Type 36 House; Digital Literacy; Education.*

Introduction

In the era of rapid technological advancement, the field of architecture and interior design has increasingly relied on digital tools to improve precision, creativity, and efficiency in the design process. Among the most widely used software in the architecture and engineering industries are **AutoCAD** and **SketchUp**, both of which play a significant role in transforming conceptual ideas into detailed, three-dimensional representations. Mastering these tools has become essential for students who aspire to pursue careers in architecture, civil engineering, or related design fields.

Despite their importance, many students—particularly those in secondary schools—have limited access to professional design software training. This limitation often results from the lack of specialized courses, insufficient technical resources, or a shortage of instructors with expertise in design technology. To address this gap, community service programs that introduce students to practical design tools are crucial for enhancing their digital literacy and future career readiness.

This community engagement project was conducted at **Srichiwan Wittaya School** in **Yala, Thailand**, with the primary goal of equipping students with fundamental skills in residential architectural design using AutoCAD and SketchUp. The training focused on the **Type 36 house model**, a compact and functional residential design commonly used in Southeast Asia. Through a combination of lectures, hands-on workshops, and guided practice sessions,

students were introduced to the basic principles of technical drawing, digital modeling, and visualization techniques.

By the end of the program, participants were expected to develop a practical understanding of how to create architectural drawings and 3D models using modern design software. This initiative not only aimed to enhance students' technical competencies but also to inspire them to explore careers in the fields of architecture, engineering, and design. Moreover, the program serves as a collaborative effort to strengthen educational cooperation and knowledge exchange between Indonesian academic institutions and educational partners in Thailand.

Methodology

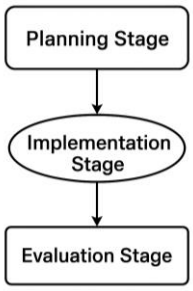

Figure 1. Flowchart of the community service methodology. The implementation process consists of three main stages

This community service program was designed as a **practical training workshop** aimed at enhancing students' knowledge and skills in residential architectural design using **AutoCAD** and **SketchUp**. The activity was carried out through a structured series of stages—planning, implementation, and evaluation—to ensure the training achieved its intended objectives.

1. Planning Stage

The preparation stage involved coordination between the organizing team from the university and **Srichiwan Wittaya School** in Yala, Thailand. This included identifying the training needs, determining the appropriate curriculum, and preparing the necessary teaching materials, software, and equipment. The training modules were developed to suit the participants' educational background, focusing on fundamental design principles, software introduction, and basic drawing techniques.

2. Implementation Stage

The training was conducted over a period of several days, involving a combination of theoretical sessions and practical workshops. Participants consisted of high school students with an interest in architecture and design. The program was delivered through the following methods:

- **Lectures and Demonstrations:** Introduction to basic architectural concepts, design elements, and the fundamental features of AutoCAD and SketchUp.

- **Hands-on Practice:** Participants engaged directly with the software to create technical drawings and 3D models of a **Type 36 house**.
- **Guided Exercises:** Step-by-step design projects under the supervision of instructors, ensuring that students could apply theoretical knowledge in a practical context.
- **Collaborative Learning:** Group discussions and peer-to-peer support were encouraged to enhance problem-solving and creativity.

During the sessions, students learned how to draw floor plans, elevations, and sections using AutoCAD, followed by transforming these 2D drawings into 3D visualizations in SketchUp. Emphasis was placed on understanding spatial planning, measurement accuracy, and realistic rendering.

3. Evaluation Stage

At the end of the training, an evaluation was conducted to assess participants' learning outcomes and skill acquisition. This involved a final design project in which students presented their completed **Type 36 house model**. Feedback was provided individually to help students understand their strengths and areas for improvement. Additionally, a post-training survey was distributed to collect participants' responses and measure satisfaction with the program.

RESULTS AND DISCUSSION

1. Participant Profile and Engagement

The community service program was successfully conducted with the participation of senior secondary students from **Srichiwan Wittaya School** in Yala, Thailand, who expressed a strong interest in architecture, civil engineering, and design technology. Most participants were between 15 and 18 years old and had limited prior experience with digital design tools. Despite their initial unfamiliarity, attendance and engagement levels remained consistently high throughout the training sessions. Students displayed significant enthusiasm during the workshops, particularly when transitioning from theoretical explanations to hands-on practice.

As the sessions progressed, their confidence in using **AutoCAD** and **SketchUp** increased noticeably. On the first day, participants required assistance with basic navigation and interface recognition, but by the final session, they could independently manage project files, utilize essential tools, and perform modeling tasks with minimal guidance. This shift demonstrated both the effectiveness of the training approach and the students' capacity for rapid skill acquisition when given structured and supportive instruction.

Figure 2. Group photo of participants, instructors, and organizing team during the "36 Type House Design Training Using AutoCAD and SketchUp" community service program held at **Srichiwan Wittaya School, Yala, Thailand.**

2. Mastery of AutoCAD Skills

A major learning outcome of the program was the acquisition of **fundamental AutoCAD skills**, which are essential for technical drawing and architectural planning. Students learned how to use key commands such as **LINE, OFFSET, TRIM, EXTEND, and FILLET**, as well as the importance of maintaining precision in drafting. They also practiced creating and organizing **layers** for different building components (walls, openings, furniture, annotations), applying **dimension styles**, and maintaining proper **scaling** and **units**.
By the end of the training, most participants were capable of producing a complete **floor plan** of a Type 36 house from scratch. They successfully delineated exterior walls, designed interior partitions, placed doors and windows using standard blocks, and added accurate dimensions. Early mistakes, such as misaligned walls, inconsistent dimensions, or incorrect scaling, significantly decreased after targeted instructor interventions and collaborative peer review exercises. This progression highlighted the students' growing attention to detail and adherence to professional drafting standards.

3. Transition to 3D Modeling with SketchUp

The second phase of the training involved transferring the 2D floor plans into **3D models** using **SketchUp**, a critical skill for architectural visualization. Students learned how to generate surfaces from closed perimeters, extrude walls with the **Push/Pull** tool, and organize elements into **Groups** and **Components** for efficient editing and reuse. They also explored how to apply **materials and textures** to distinguish structural elements and experimented with **camera tools** and **scenes** for effective presentation.
The **Type 36 house model** was chosen as the primary project because of its simplicity, relevance, and pedagogical value. The compact design allowed students to focus on mastering core modeling concepts without being overwhelmed by complexity, while also teaching them about spatial efficiency, door swing clearances, wall thickness, and roof geometry. By the end of the program, most participants could produce a complete 3D representation of the house and present it from multiple perspectives.

4. Evaluation of Student Outputs

A comprehensive rubric-based evaluation was conducted to assess the quality of students' final outputs across four dimensions:

1. **Geometric Accuracy** – Correct use of coordinates, orthogonality, and alignment.
2. **Technical Competence** – Effective use of software tools, layers, and components.
3. **Functional Layout** – Logical and efficient spatial arrangement.
4. **Presentation Quality** – Clarity of annotations, rendering, and visual communication.

Overall, participants performed strongly in **accuracy** and **technical competence**. They demonstrated precise drafting, well-structured layers, and clean model organization. The **functional layout** dimension reflected thoughtful planning, with appropriate room sizes, efficient circulation, and coherent zoning. **Presentation quality** varied more widely—while

many produced clear drawings and organized 3D views, some required additional guidance on annotation hierarchy and scene composition, indicating an area for future instructional emphasis.

5. Evidence of Learning and Progress

Throughout the training, formative assessments were conducted at the end of each session to measure incremental learning. Early tasks emphasized precision drafting and fundamental commands, while later exercises focused on parametric thinking, component reuse, and spatial visualization. The final project—developing a complete Type 36 house model with floor plan, elevation, section, and 3D view—demonstrated significant growth in students' capabilities.

Students also showed marked improvements in **problem-solving skills**. Initially, they frequently sought instructor assistance for basic tasks. However, by the end of the program, they were more independent—consulting command prompts, using inference cues in SketchUp, and troubleshooting errors without external help. This evolution reflected not only technical learning but also the development of design thinking and self-directed learning habits.

Figure 3. Classroom session during the theoretical part of the "36 Type House Design Training" program, where participants learned basic architectural design concepts and software functions.

6. Challenges Encountered

Despite the program's success, several challenges emerged. The most significant issue was **hardware limitation**, as variations in computer specifications occasionally caused lag during complex modeling tasks. This was mitigated by optimizing file sizes, encouraging component reuse, and simplifying models where necessary. Another challenge was the **language barrier**, as architectural terminology in English was unfamiliar to many students. Bilingual glossaries, on-screen translations, and contextual explanations helped bridge this gap.

Time constraints also posed difficulties, particularly for slower learners who struggled to complete certain parts of the project. To address this, instructors emphasized a "**progress over perfection**" approach, providing extra office hours and one-on-one support sessions to ensure all participants achieved satisfactory outcomes.

7. Broader Impact on Digital and Design Literacy

Beyond technical skills, the program significantly enhanced students' **design literacy**. They gained a deeper understanding of spatial relationships, functional adjacency, ventilation, natural lighting, and furniture layout. Furthermore, they adopted an **iterative approach** to design—experimenting with multiple solutions, refining geometry, and revising layouts until the results aligned with principles of comfort, usability, and constructability.

Exposure to both **AutoCAD** (precision drafting) and **SketchUp** (spatial visualization) equipped students with **transferable skills** applicable to future careers or higher education in architecture, civil engineering, or interior design. This dual-software approach provided a holistic foundation, balancing technical rigor with creative exploration.

8. Sustainability and Recommendations

To ensure the sustainability of the program's impact, the instructors provided template files, component libraries, and instructional guides for teachers to continue the exercises independently. Recommendations were also given to the school's IT department regarding file organization, software maintenance, and strategic hardware upgrades—such as increasing RAM—to enhance performance within budget constraints.

Integrating this module into existing curriculum subjects, such as technology or art, was proposed as a way to reinforce learning outcomes and provide continuous skill development opportunities for future student cohorts.

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9. Limitations and Future Directions

While the program achieved its objectives, limitations remained. The training duration restricted exploration of advanced topics such as construction detailing, rendering, and environmental design considerations. Future iterations could expand the curriculum to include **site context analysis**, **sustainability strategies**, and **climate-responsive design**. Additionally, collaboration with local industry professionals could provide participants with real-world project exposure and mentorship.

C0NCLUSION

The community service program titled *"36 Type House Design Training Using AutoCAD and SketchUp"* conducted at **Srichiwan Wittaya School, Yala, Thailand**, successfully achieved its primary objective of enhancing students' knowledge and practical skills in digital architectural design. Through a series of structured theoretical and hands-on sessions, participants gained essential competencies in technical drafting, 3D modeling, and spatial visualization. They were able to design and model a standard Type 36 residential building independently, demonstrating increased proficiency and confidence in using professional design software.

The program also significantly contributed to students' broader understanding of architectural principles, spatial planning, and the iterative design process. Beyond technical skills, participants developed critical thinking, problem-solving abilities, and collaborative learning habits that are essential for future academic and professional pursuits in architecture

and civil engineering. Moreover, the training strengthened educational collaboration between Indonesian higher education institutions and Thai schools, paving the way for future joint programs and sustainable partnerships.

Despite minor challenges such as hardware limitations, language barriers, and time constraints, the outcomes indicate that the training had a positive and meaningful impact. The participants' active engagement, substantial skill improvement, and enthusiastic feedback highlight the program's success and relevance. Future initiatives could further expand the curriculum to include sustainable design, site analysis, and environmental considerations, ensuring a more comprehensive learning experience. Overall, this program demonstrates the effectiveness of community-based educational collaboration in empowering students with digital competencies and preparing them for future challenges in the field of architecture and design.

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