

**البرامج الافتراضية ثلاثية الأبعاد والنحت الرقمي كوسيلة للتعليم التفاعلي لتطوير
الخيال والابتكار لدى الطلاب في مجالات تكنولوجيا الصناعات الخشبية والنحت
والعمارة الداخلية**

**Virtual 3D. Programs and Digital Sculpture as means of interactive
education to develop imagination and innovation among students in the
fields of Wood Industries Technology, Sculpture and Interior
Architecture.**

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ملخص الدراسة

يوجد عدد كبير من البرامج الافتراضية ثلاثية الأبعاد القابلة للتطبيق للأغراض التعليمية والعملية لزيادة وعي الطلاب واستيعابهم، وبالتالي تحسين قدرات الخيال والإبداع والابتكار. كثيرًا ما يواجه التلاميذ عوائق في استيعاب المعلومات الجديدة وتصورها من خلال تقنيات الرسم التقليدية. توفر هذه التطبيقات الافتراضية بيئة تفاعلية حيث يمكن للطلاب الاستكشاف والتدقيق في جميع الجوانب وفحص الخطوات الإجرائية بشكل منهجي، مما يساعد في تحديد الكميات والمواصفات للمنتجات. وتم شرح أهم مميزات كل برنامج من البرامج الثلاثية الأبعاد، وتعريف النحت الرقمي وما يميزه، وعلاقة هذه البرامج بالتخصصات المختلفة كالعمارة الداخلية، والنحت، وتكنولوجيا الصناعة الخشبية. واعتمد الباحثون المنهج الوصفي التحليلي لفحص بعض تلك البرامج والمنهج

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التطبيقي من خلال الأعمال التطبيقية في مجال العمارة الداخلية والنحت وتكنولوجيا الصناعات الخشبية. وفي نهاية الدراسة تم التوصل إلى بعض النتائج المهمة، كما تم تقديم بعض التوصيات

الكلمات الدالة:

- البرامج الافتراضية ثلاثية الأبعاد، النحت الرقمي، العمارة الداخلية، تكنولوجيا الصناعات الخشبية، النحت.



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Abstract

There exist a plethora of three-dimensional virtual softwares viable for educational and practical purposes to augment student awareness and comprehension, thereby improving faculties of imagination, creativity, and innovation. Pupils frequently encounter impediments in grasping and conceptualizing novel information through conventional sketching techniques. These virtual applications furnish an interactive environment wherein students can explore to scrutinize all facets and methodically examine the procedural steps, aiding in the delineation of quantities and specifications. The most important features of each of the three-dimensional programs, the definition of digital sculpture and what distinguishes it, and the relationship of these programs to various specializations such as interior architecture, sculpture, and wood industry technology were explained. The researchers adopted a descriptive-analytical approach to scrutinize select applications and the applied approach through applied works in the field of Interior Architecture, Sculpture, and Wood Industries technology. At the end of the study, some important results were reached, and some recommendations were also given

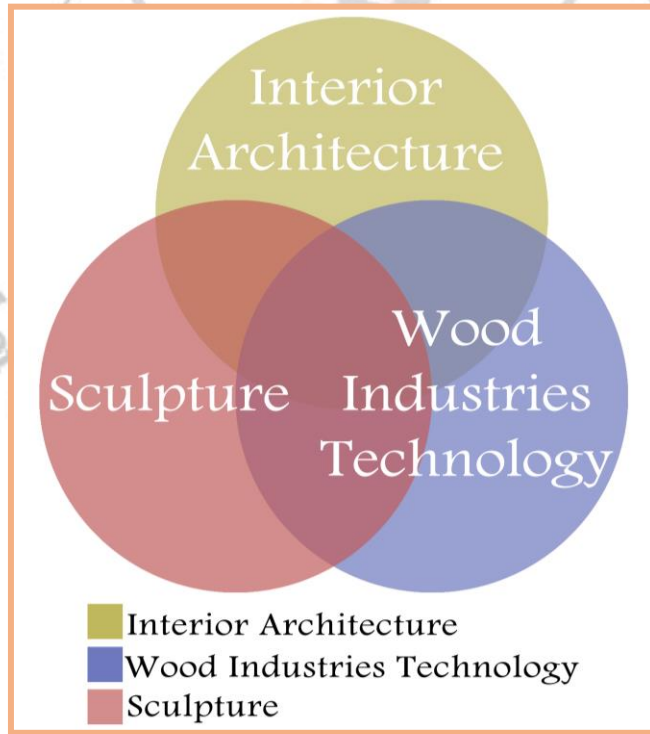
Keywords:

- Virtual 3D programs. - Digital Sculpture. -Interior Architecture, Wood Industry technology, Sculpture

1. Introduction

Virtual three-dimensional learning environments constitute a modern concept that integrates virtual learning technology with three-dimensional realms. These environments represent digital learning resources adept at replicating reality and fostering learner interaction. Positioned as an innovative educational technological development, they leverage the third dimension to augment realism and empower users to engage in events and behaviors akin to real-world scenarios.

This study targets students in the following disciplines, given their interdisciplinary nature across numerous facets: Wood Industries Technology program, Sculpture major, Interior Architecture Major.



1.1. Problem of Research

- Some students face challenges in imagination, comprehension, and cognition while elucidating practical and executive facets in classrooms. Consequently, digital programs serve as a method for enhancing awareness.
- The imperative to keep abreast of technological advancements in the educational sphere.

1.2. Aim of Research

- Facilitating an interactive educational milieu to augment learner acquisition.
- Administering the educational process via virtual three-dimensional digital learning Programs.
- Undertaking the production of detailed project drawings and conducting a comprehensive analysis of implementation phases to identify and mitigate challenges prior to actual execution.

1.3. Research Methodology

- The research follows the descriptive analytical approach for three-dimensional programs and the applied approach through applied works in the field of Interior Architecture, Sculpture, and Wood Industries technology.

1.4. Research Assumes

- Three-dimensional digital simulation programs augment the imaginative and creative faculties of students.
- Virtual three-dimensional programs facilitate the resolution of implementation challenges prior to commencing actual execution.
- Three-dimensional virtual programs epitomize an optimal environment for interactive learning and for studying diverse stages of design and execution.

2. Virtual 3D. programs

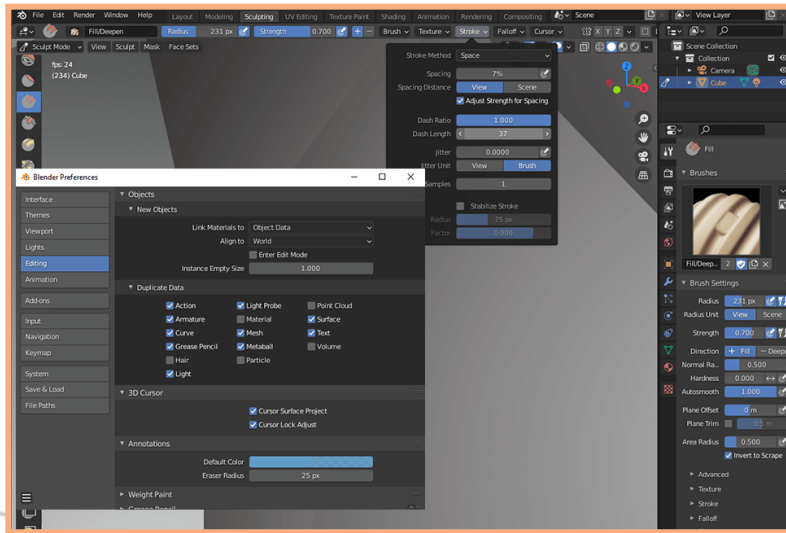
Virtual reality technologies are contingent upon the successive technological evolutions in computer software. These multifarious and varied programs, spanning across diverse fields and scientific domains, leverage virtual reality methodologies. These technologies are not only evident but also serve across a plethora of scientific spheres, encompassing medical, engineering, and various industrial sectors. Furthermore, they find utility in sophisticated imaging sciences, cinematographic illusions, and the design of technologically advanced gaming systems. Concerning the potential applicability of certain categories of these programs within the realms of interior architecture, wood industries technology, and sculptural art, the judicious selection from among the program categories utilized in shaping and modeling tangible forms is deemed optimal [1]. These program categories are employed across several engineering, industrial, and artistic disciplines, including architecture, interior decoration, woodworking product fabrication, and artistic sculpting. The most salient categories of such programs can be delineated and classified as follows:

2.1. Blender:

Blender is the free and open source 3D creation suite. It supports the entirety of the 3D pipeline—modeling, rigging, animation, simulation, rendering, compositing and motion tracking, even video editing and game creation. Advanced users employ Blender's API for Python scripting to customize the application and write specialized tools; often these are included in Blender's future releases. Blender is well suited to individuals and small studios [2].

Fig.1 Interface of Blender – 3D modeling software [2].

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2.2. Cinema 4D

A sophisticated software application for three-dimensional graphics modeling, animation, simulation, and rendering. It serves as a robust and versatile tool, enhancing the feasibility and efficiency of three-dimensional workflow across various design disciplines [3].

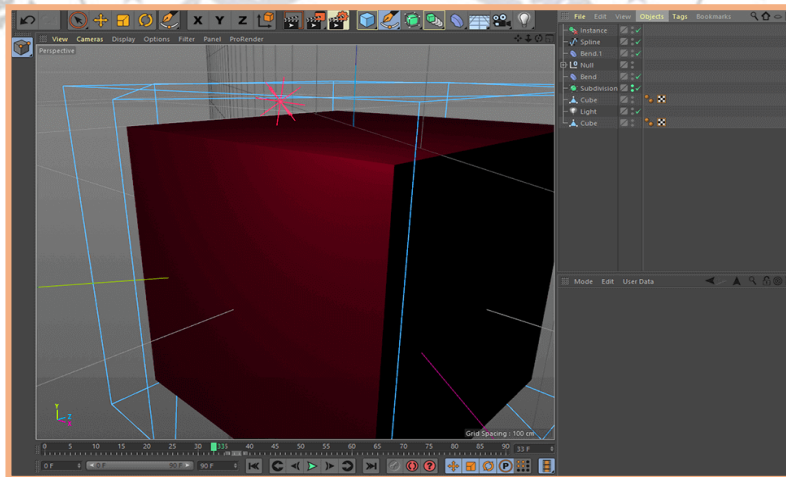


Fig.2 Interface of Cinema 4D – 3D modeling software [3]

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2.3. Autodesk 3DS Max

One of the preeminent technological software applications for employing virtual reality processors and methodologies, as well as for modeling or simulation. It relies upon design, shaping, and animation functionalities, in conjunction with the generation of three-dimensional entities. Developed by Autodesk [4].

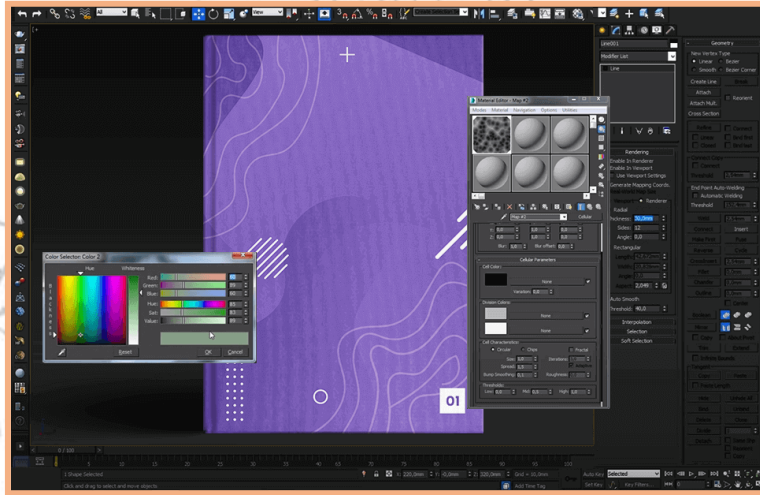


Fig.3 Interface of 3ds Max – 3D modeling software [4].

2.4. Zbrush

ZBrush is the industry standard digital sculpting software. The latest version features an updated Anchors Brush system which provides an intuitive way to deform meshes by applying anchors onto a mesh while allowing for actions to be performed. The Knife Brushes gain increased design dexterity with a Split to Parts feature set allowing parts to be cut off and retained. Insert Mesh brushes are now compatible with Stroke menu options providing a wild range of visual possibilities. ZBrush provides access to diverse workflows and limitless creative possibilities [5].

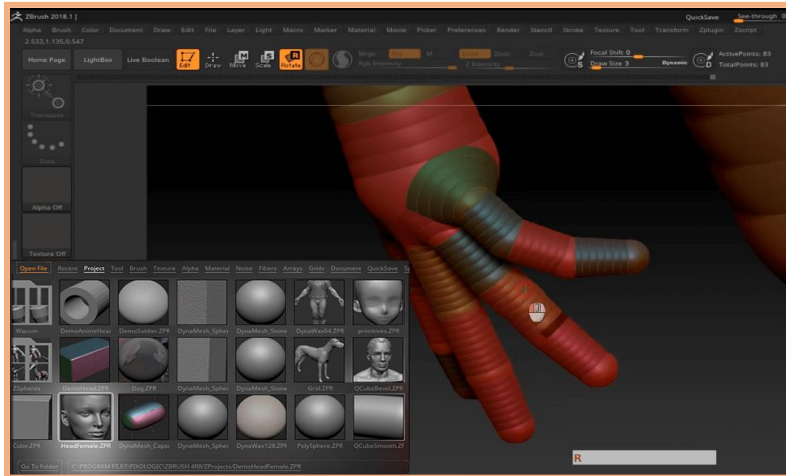


Fig.4 Interface of ZBrush – 3D modeling software [5].

2.5. SketchUp

One of the foremost specialized computer programs, also adept in virtual reality processing and modeling or simulation techniques. It relies upon the capabilities of design, sculpting, and animation, as well as the production of three-dimensional entities, through a wide array of toolsets and diverse applications. These are utilized across various fields and disciplines, including architectural drawing, interior and exterior design, furniture design, civil, and mechanical engineering [6].

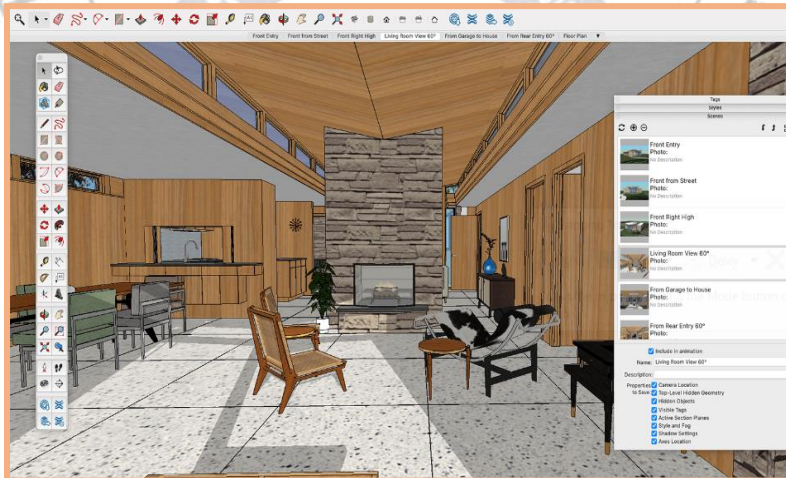


Fig.5 Interface of SketchUp – 3D modeling software [6].

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2.6. Maya

Maya is a 3D computer graphics application, originally developed by Alias and currently owned and developed by Autodesk. It creates assets for interactive 3D applications [4].

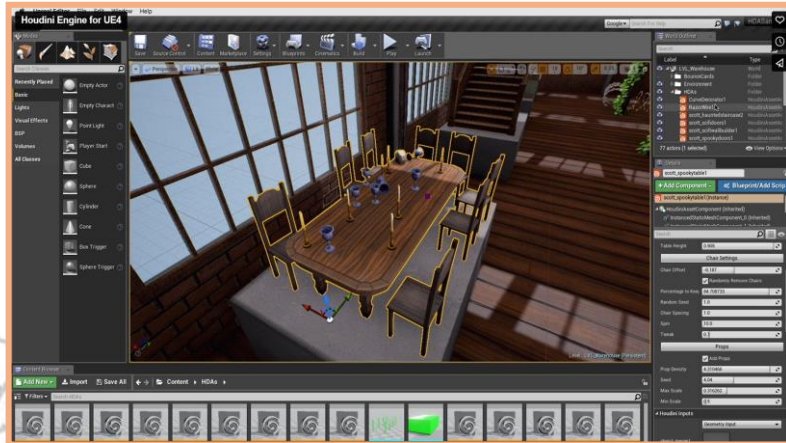


Fig.6 Interface of Maya – 3D modeling software [4].

2.7. Houdini

Houdini is a 3D animation software application developed by Toronto-based SideFX, who adapted it from the PRISMS suite of procedural generation software tools [7].

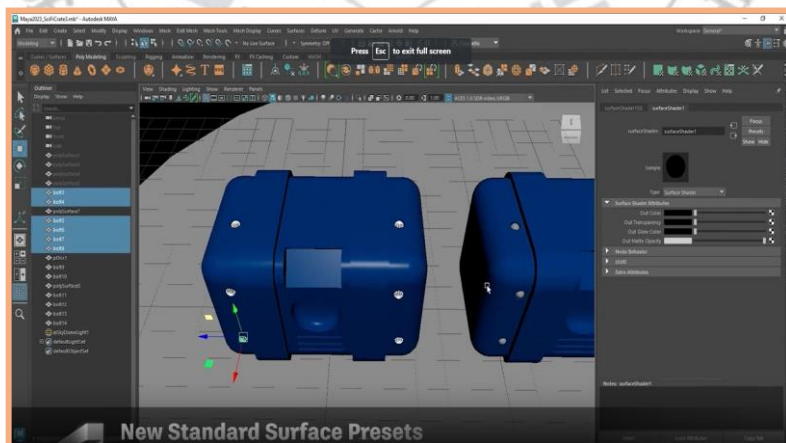


Fig.7 Interface of Houdini – 3D modeling software [7].

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3. Digital Sculpture

The concept of "digital sculpture" denotes a convergence of technological advancements and creative endeavors, representing a paradigm shift in expressive culture and offering a fresh visual paradigm. Moreover, "digital sculpture" encompasses digital representations in their tertiary forms:

- A. Three-dimensional designs created digitally using computerized systems.
- B. Three-dimensional designs actualized within virtual settings subsequent to their digital genesis.
- C. The finalized models generated through modern techniques integrated with computing systems, encompassing laser or CNC machinery, and various other advanced modeling methodologies such as 3D printing processes or rapid prototyping.

Digital sculpture is characterized by its emancipation from physical constraints, facilitating the preservation of sculptures, ease of manipulation, production of tangible artifacts, and unlimited experimental possibilities. Among the methodologies of digital sculpting: Three-dimensional printing technology - Scanning technology [8].

4. Applications :

Researchers utilized one of virtual 3D. programs - SketchUp- as a tool to fulfill some objectives such as, providing the interactive education, good education, increasing the imaginary and innovation of students. These objectives are aiming at achieving the sustainability.

4.1. First Application: Utilizing SketchUp Program to design and study steps of implementation – Restaurant (Space, Furniture and Carved Units) by utilizing SketchUp :

Utilizing SketchUp program to design and study the steps of implementation of the interior space of a restaurant, including its wooden cladding, wooden furniture, and sculptures made of different materials. [9].

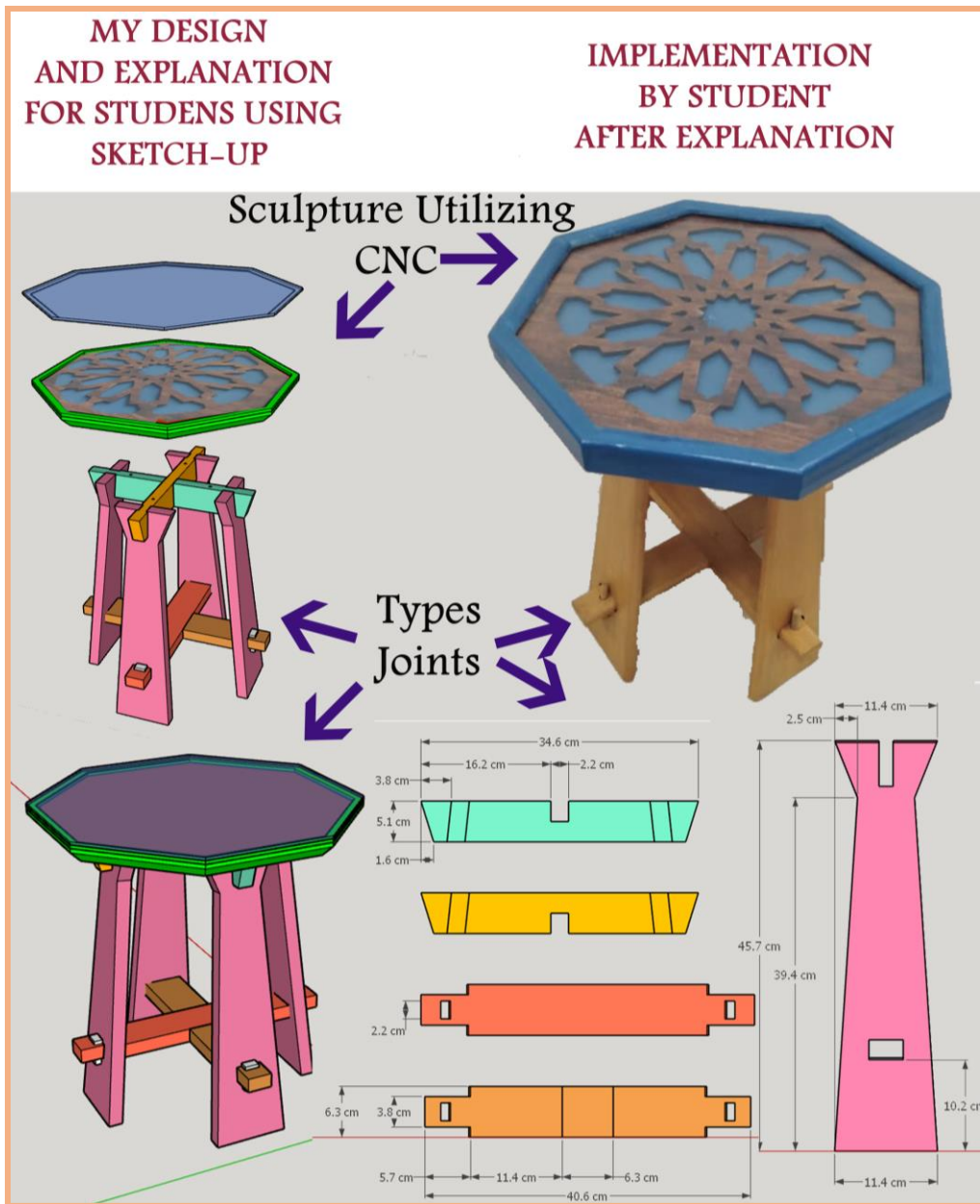


Fig.9 3D. programs as a tool for explanation to students for improving their awareness and execution – the stage of design and steps of implementation [9].

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4.3. Third Application: utilizing SketchUp Program to design and study steps of implementation –Facades of an Arab museum:

I have designed an Arab museum utilizing SketchUp software, integrating wooden sunbreakers, wooden beverage Mashrabya – arab window bay -, and incorporating wooden pergolas on the building's roof.



Fig.10 3D. programs as a tool for explanation to students for improving their awareness and execution – the stage of design and steps of implementation [9].

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4.4. Third Application: utilizing SketchUp Program to design and study steps of implementation –Kitchen and its executive drawing:

Employing the SketchUp software for the design of a kitchen within a residential apartment, utilizing appropriate materials within the program to simulate real-world conditions. Additionally, generating detailed executive drawings for wood cutting and assembly in physical settings, while also assessing accessories in accordance with client needs and budgetary considerations.

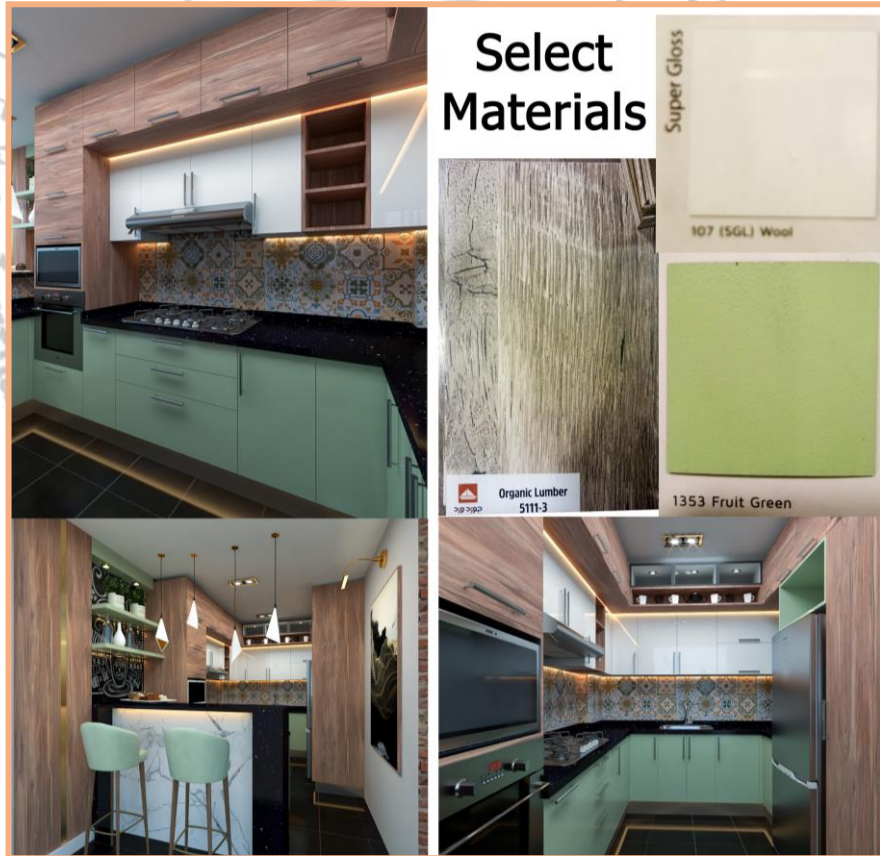


Fig.11 3D. programs as a tool for designing the kitchen and selecting the materials [9].

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Fig.12 3D. programs as a tool for preparing the executive drawing [9].

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Findings:

- 1- Utilizing 3D virtual programs increases students' understanding and awareness, which helps them to be creative and innovative.
- 2- The design and implementation stages can be studied in the field of interior architecture, wood industry technology - woodworking technology - and sculpture; Which helps the student know the challenges to solve before actual implementation.
- 3- The use of virtual 3D programs has saved a lot of time and effort and a variety of design and implementation solutions.

Recommendation:

- 1- Teaching 3D virtual programs in academic courses.
- 2- Teaching 3D virtual programs in academic and vocational – craft - courses; Which helps to increase the student's knowledge and skills.
- 3- Preparation of instructional staff capable of effectively utilizing these software tools, and establishment of protocols with the owning entities to obtain complimentary licenses for these software applications.

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