

The Effectiveness of an Integrated Approach to Macramia Art, Digital Technologies, and E-Marketing in Developing Creative Production Skills and Promoting Self Employment among Art Education Students in the Context of the Creative Economy and Egypt ' Vision 2030

Samah Abdallah Mohammed Alrefai

Associate Professor of Art and popular works, Department of Art Education, Faculty of Specific Education, Kafrelsheikh University, Egypt

Abstract

This study aimed to investigate the effectiveness of an integrated approach combining macramé, digital technologies, and e-marketing in developing creative production skills and fostering a spirit of entrepreneurship among art education students, in light of the requirements of the creative economy and Egypt's Vision 2030. The study employed a quasi-experimental design with two groups (experimental and control) using pre- and post-testing. The sample consisted of 80 third-year art education students from the Faculty of Specific Education, divided into two equivalent groups: an experimental group of 40 students and a control group of 40 students. To achieve the study's objectives, the researcher developed an enrichment unit based on the integration of macramé, digital technologies, and e-marketing within the Arts and Crafts (3) course. She also developed a creative production assessment tool and a scale measuring attitudes toward entrepreneurship. The study instruments were administered to both groups before and after the intervention. The results showed statistically significant differences at the 0.05 level between the mean scores of the experimental and control groups on the post-test of the Creative Production Assessment Card and the Self-Employment Attitude Scale, favoring the experimental group. The results also showed statistically significant differences between the pre-test and post-test scores of the experimental group, favoring the post-test. Furthermore, the results revealed a strong positive correlation between creative production and self-employment attitudes among the experimental group. The study's findings confirm the effectiveness of the proposed integrated approach in developing creative production skills and fostering self-employment attitudes among art education students. They also underscore the importance of integrating digital technologies and e-marketing into art education, which supports the demands of the creative economy and contributes to achieving the goals of Egypt's Vision 2030.

Keywords: Macrame art, digital technologies, e-marketing, creative production, self-employment, creative economy, Egypt's Vision 2030, art education.

Introduction

The contemporary world is witnessing rapid transformations driven by the digital revolution and successive technological advancements, which have reshaped concepts of production, labor, and the economy at large. Creative industries have emerged as key drivers of sustainable economic growth, owing to their capacity to transform creative ideas and skills into products and services of both economic and cultural value. In this context, it has become essential to re-evaluate art education programs to ensure graduates are equipped to leverage their creative skills in producing innovative art projects that are marketable and competitive in today's labor market.

Art education holds significant potential to contribute to the growth of the creative economy; it fosters students' innovative capabilities and productive skills, offering diverse opportunities to transform artistic practices into productive projects that drive economic and social development. Macramé—a hand-weaving art form—is distinguished by its rich aesthetic variety and diverse functional applications. This makes it a fertile field for creating artworks that blend authenticity with innovation, while remaining adaptable to the demands of modern markets.

In recent years, creative industries have undergone a notable transformation due to the integration of digital

technologies into design, production, and marketing processes. Digital tools have become central to developing creative ideas and producing designs with greater diversity and flexibility, while also expanding market access through online platforms and e-commerce stores. International reports indicate that the creative economy has become one of the fastest-growing sectors globally, with digitalization serving as a crucial factor in enhancing its capacity for innovation, job creation, and sustainable development (UNCTAD, 2022).

Recent literature also confirms that integrating digital technology into creative fields helps expand economic opportunities, improve production efficiency, and boost the competitiveness of creators in both local and global markets.

In light of the shift toward a knowledge-based economy, educational institutions are required to prepare students for the demands of the future labor market by fostering skills in creativity, entrepreneurship, and freelancing. This involves linking curricula to practical applications that enable learners to produce and market their work in a real-world context; indeed, recent studies suggest that the integration of arts and digital technology helps cultivate a workforce capable of innovating and adapting to the evolving needs of creative industries,

while also building professional skills that extend beyond traditional learning to encompass production, marketing, and creative project management.

In the Egyptian context, "Egypt Vision 2030" places significant emphasis on digital transformation, the knowledge economy, and the promotion of innovation and entrepreneurship as fundamental pillars for achieving sustainable development. It also underscores the importance of leveraging technology to advance education and cultivate human capital capable of competing and producing. The vision documents affirm that digital transformation, innovation, and support for small enterprises and entrepreneurship serve as key mechanisms for expanding employment opportunities and achieving sustainable economic development.

Against this backdrop, the researcher posits that teaching the art of macramé solely through traditional methods is no longer sufficient to keep pace with current shifts in the creative industries. This necessitates the development of integrative educational approaches that link traditional artistic skills with modern digital technologies and e-marketing, thereby fostering creative production skills and encouraging a mindset oriented toward freelancing among art education students. Furthermore, providing students with the opportunity to digitally design their artistic products, execute them as innovative macramé pieces, and subsequently showcase and market them via an online store offers a practical model that combines learning, production, and entrepreneurship—aligning with the demands of the creative economy and Egypt Vision 2030.

Consequently, the current research aims to investigate the effectiveness of an integrative approach — combining macramé art, digital technologies, and e-marketing—in developing creative production skills and a freelancing mindset among art education students. This approach seeks to enhance the role of art education in supporting creative industries and to prepare graduates who are better equipped to integrate into the modern labor market and transform their artistic capabilities into sustainable productive and economic opportunities.

Research Problem

Recent decades have witnessed fundamental shifts in the nature of creative industries, driven by the rapid evolution of digital technologies and the growing role of the creative economy as a key engine for sustainable development and the knowledge-based economy. This transformation has moved the concept of the artistic product beyond a purely aesthetic creation; it has become an economic resource capable of generating added value, creating jobs, and fostering entrepreneurship. Consequently, educational institutions are now required to reformulate their pedagogical approaches to integrate traditional artistic skills with modern digital technologies and e-marketing mechanisms.

Macramé is an art form offering rich aesthetic and functional qualities, enabling the creation of pieces with diverse artistic and economic value. However,

instruction in this art within many academic programs continues to focus on traditional technical skills, often failing to systematically incorporate digital technologies or leverage e-marketing potential to enhance product development, marketability, and economic sustainability.

An analysis of recent literature in art education, the creative economy, and digital transformation reveals a relative scarcity of studies addressing integrative approaches that combine traditional handicrafts, digital technologies, and e-marketing. There is a need for frameworks that foster creative production skills and encourage a shift toward freelancing among art education students. Furthermore, a preliminary study conducted by the researcher highlighted students' limited experience in using digital technologies to develop their artistic products, as well as a lack of awareness regarding the opportunities e-commerce platforms offer to transform artistic production into a sustainable economic activity. In light of the foregoing, there is an urgent need to develop contemporary instructional approaches in the field of art crafts that transcend traditional macramé practices. These approaches should leverage digital technologies and e-marketing to enhance artistic products and boost their creative and economic value. Furthermore, there is a need to establish educational models that prepare art education students to engage with the demands of the creative economy and to develop their ability to apply artistic skills toward creating marketable projects. Such models would foster an orientation toward freelancing and support Egypt's Vision 2030 goals regarding innovation, digital transformation, and sustainable development.

Consequently, a need has emerged to design an integrative approach combining macramé, digital technologies, and e-marketing, and to evaluate its effectiveness in developing creative production skills and a freelancing mindset among art education students—a challenge that constitutes the core research problem addressed by this study.

Accordingly, the main research question can be formulated as follows:

What is the effectiveness of an integrative approach combining the art of macramé, digital technologies, and e-marketing in developing creative production skills and attitudes toward freelancing among Art Education students, in light of the requirements of the creative economy and Egypt's Vision 2030?

The following sub-questions stem from the main research question:

1. What are the theoretical, artistic, and practical foundations of the integrative approach combining the art of macramé, digital technologies, and e-marketing, in light of the requirements of the creative economy and Egypt's Vision 2030?
2. What is the effectiveness of the proposed integrative approach in developing creative production skills among Art Education students?
3. What is the effectiveness of the proposed integrative approach in developing attitudes

toward freelancing among Art Education students?

4. What is the nature of the relationship between the level of creative production skills and attitudes toward freelancing among Art Education students?

Research Significance

- Theoretical Significance:

The theoretical significance of the research stems from its aim to construct a contemporary knowledge framework linking art education, the creative economy, and digital transformation. It contributes to expanding the literature on developing traditional handicrafts by integrating them with digital technologies and e-marketing. Furthermore, the research offers a theoretical perspective on activating the role of art education in supporting creative industries and fostering a culture of freelancing and entrepreneurship among university students.

- Applied Significance:

1. Presenting an integrative educational approach applicable to art education teacher preparation programs.
2. Developing creative production skills related to innovation, development, and the aesthetic and functional application of art products.
3. Fostering a positive attitude toward freelancing through practical experience in design, production, and e-marketing.
4. Supporting digital transformation trends in university education.
5. Contributing to the achievement of Egypt's Vision 2030 goals regarding the knowledge economy, entrepreneurship, and sustainable development.
6. Providing an applied model that can be utilized to develop handicrafts courses in Arab universities.

Research Objectives

The research aims to:

1. Construct an integrative approach based on macramé art, digital technologies, and e-marketing.
2. Determine the effectiveness of the proposed approach in developing creative production skills among art education students.
3. Determine the effectiveness of the proposed approach in fostering a positive attitude toward freelancing among art education students.
4. Develop students' ability to utilize digital applications to create contemporary designs for handicrafts.
5. Develop skills for showcasing and marketing art products via digital environments.
6. Investigating the relationship between the level of creative output and the attitude toward freelance work among the sample members.

Experimental Methodology

The research employed a quasi-experimental approach, as it is one of the most suitable methods for

studying the impact of independent variables on dependent variables within educational settings. An equivalent-groups design (experimental and control) was used, incorporating both pre-test and post-test measurements.

The experimental intervention involved applying the proposed integrative approach—which combines the art of macramé with digital technologies and e-marketing—to the experimental group. Meanwhile, the control group was taught using the standard method typically employed for the "Artistic Crafts" course.

The experimental design is structured as follows:

- Experimental Group: O1 – I – O2
- Control Group: O1 – O2

Where:

- O1 = Pre-test.
- I = Proposed integrative approach.
- O2 = Post-test.

Research Sample

The research sample consisted of third-year students from the Art Education Department at the Faculty of Specific Education, as they were studying the "Artistic Crafts" course, which includes macramé in its curriculum.

The sample members were assigned to two equivalent groups:

- An experimental group.
- A control group.

Equivalence between the two groups regarding the research variables was verified prior to the implementation of the study.

Foundations of the Experiment

The development of the integrative approach was based on a set of intellectual and educational pillars, namely:

1. The philosophy of the creative economy.
2. Constructivist learning theory.
3. Project-based learning.
4. The arts-technology integration approach.
5. Digital transformation in education.
6. Entrepreneurship and freelancing.
7. Objectives of Egypt's Vision 2030.

Research Tools

1. The proposed integrative approach. (Developed by the researcher).
2. Creative production skills assessment rubric. (Developed by the researcher).
3. Scale of attitudes toward freelancing. (Developed by the researcher).

Theoretical Framework

Art education is considered one of the educational fields most closely linked to creative economy concepts, given the learning environments it provides that foster learners' innovative and productive capabilities. It enables them to leverage their artistic expertise to create projects with economic viability. Macramé art is one such field within art education that holds significant potential in this regard, offering aesthetic, sculptural, and functional qualities that can

be developed and innovated through modern digital technologies.

Accordingly, the theoretical framework addresses the following themes: the art of macramé; digital technologies in art education; e-marketing for creative products; creative production; freelancing and entrepreneurship; the creative economy; and Egypt's Vision 2030 in relation to art education and digital transformation.

Section One: The Art of Macramé

• The Concept of Macramé

Art literature defines macramé as the art of shaping threads and cords through a system of diverse knots executed by hand to create artworks or functional products that combine aesthetic and utilitarian values. This art form is characterized by its flexibility and capacity to accommodate various artistic approaches, offering artists and learners ample opportunities for innovation and experimentation regarding form, material, and structural composition (Abdulaziz, 2022).

From an art education perspective, macramé serves as a rich field for developing learners' artistic and creative experiences. It provides opportunities for direct engagement with materials, the discovery of structural relationships between artistic elements, and the cultivation of skills in design, innovation, and artistic problem-solving. Furthermore, it fosters aesthetic sensibility and the ability to produce works that blend function with beauty—aligning with modern trends that view applied arts as a gateway to supporting creative industries and entrepreneurship (Alivizatou-Barakou & McCormack, 2022).

In recent years, the concept of macramé has expanded beyond the scope of traditional handicrafts to include the use of digital technologies for product design, development, and marketing via online platforms. This evolution has bolstered the art form's standing within contemporary creative industries and created new opportunities to transform artistic practices into productive ventures capable of competing in digital markets. The researcher posits that the art of macramé is no longer merely a craft based on executing traditional knots and decorative patterns; rather, it has evolved into a creative field open to development, experimentation, and innovation—particularly in light of current digital advancements. Furthermore, the art form's inherent versatility in shaping, along with the diversity of its materials and applications, makes it an ideal candidate for the integrative approach proposed in this study. Digital technologies can be leveraged to enhance macramé designs, and the resulting products can be marketed online, thereby helping to cultivate creative production skills and foster an entrepreneurial mindset among art education students.

• Origins and Historical Evolution of the Art of Macramé

The art of macramé traces its origins to ancient Eastern civilizations, where it emerged from the need to secure the edges of textiles and fabrics using various knots. Numerous studies indicate that Arabs played a prominent role in developing this art form and

transmitting it to Europe via Al-Andalus during the 13th and 14th centuries. Subsequently, it spread globally, becoming a textile art form distinguished by both decorative and functional qualities. The term "Macramé" is derived from the Arabic word *maqrama*, which referred to ornamented or embroidered fabrics featuring knotted fringes (Najlaa Farouk Ragab Kasba, 2022).

With the evolution of applied arts during the 20th century, macramé underwent significant transformations, shifting from traditional applications in furnishings and clothing to the creation of wall hangings, fashion accessories, and contemporary art pieces. Modern artistic trends have further expanded its scope by integrating it with diverse materials and techniques to align with the demands of contemporary art (Faryal Saeed Ahmed Salloum, 2022).

The researcher posits that the historical evolution of macramé reflects its enduring ability to adapt to cultural and artistic shifts across eras. This underscores its significant potential to incorporate contemporary technical innovations and enhances its suitability for integration into modern art education programs.

• Formal Characteristics of the Art of Macramé

Macramé is characterized by a rich formal system based on the use of textile knots as structural units capable of generating diverse forms that combine aesthetic and functional values. The formal distinctiveness of this art form stems from its reliance on linear relationships created by the intertwining of threads, cords, and various knots; this contributes to the construction of artistic compositions characterized by diversity, rhythm, movement, and visual richness (Najlaa Farouk Ragab Kasba, 2022).

Line is considered one of the most prominent formal elements in macramé, generating diverse visual paths—horizontal, vertical, diagonal, or curved—that help establish visual rhythm and movement within the artwork. Furthermore, the interplay between intersecting and intertwined lines plays a crucial role in structuring the composition and enriching its formal makeup, granting the artist significant flexibility in organizing elements within the piece (Faryal Saeed Ahmed Salloum, 2022).

Another key characteristic is macramé's adaptability for combination with other materials—such as wood, metal, beads, and fabric—which expands its formal possibilities and enhances its capacity to produce contemporary forms aligned with modern trends in applied arts and creative industries (Hala Mohamed Soliman, 2022; Ibrahim, 2022).

The researcher posits that the formal characteristics of macramé constitute a fundamental basis for its integration into the educational process, given the diverse opportunities it offers for experimentation, innovation, and development. Moreover, its inherent flexibility regarding line, texture, space, and structural relationships makes it an ideal medium for applying the proposed integrative approach—which combines manual skills with digital technologies—thereby fostering creative production skills among art education students.

• Aesthetic and Expressive Values of Macramé

The aesthetic values of macramé stem from the visual relationships created by various textile knots, where lines, textures, and negative spaces harmonize to form a cohesive structural composition that achieves unity, variety, rhythm, and balance. This interplay among compositional elements is a primary source of beauty in macramé works, lending them a distinctive visual character that combines simplicity with richness (Najlaa Farouk Ragab Kasba, 2022).

Furthermore, the structural flexibility of macramé allows it to be utilized in creating contemporary artworks that blend functionality with aesthetics, thereby enhancing its expressive value within the applied arts. Modern trends have expanded the scope of expression by integrating macramé with diverse materials and forming techniques, offering artists greater opportunities for experimentation and the creation of innovative design solutions (Mohamed Ahmed Mohamed Abdel Ghani, 2022; Ibrahim, 2022). The researcher posits that the aesthetic and expressive values of macramé extend beyond mere form or ornamentation; they encompass intellectual and creative dimensions that foster artistic sensibility and innovative thinking among students. Moreover, these values serve as a vital foundation for producing contemporary artworks capable of competing within the creative industries—aligning with the current research objectives of developing creative production skills and encouraging an orientation toward freelance work.

- **Contemporary Trends in the Art of Macramé**

Over the past decade, the art of macramé has undergone a significant transformation, evolving from a traditional craft into a field of contemporary artistic creativity that engages with modern technological and design developments. Contemporary trends have expanded the scope of macramé to encompass interior design, fashion, accessories, art pieces, and innovative craft products, thereby bolstering its standing within modern creative industries (Hala Mohamed Soliman, 2022; Ibrahim, 2022).

Furthermore, recent studies have explored the application of macramé in sustainable fashion design. Findings demonstrate that the aesthetic and structural qualities of knotted patterns can be leveraged to create innovative designs that balance aesthetics with functionality, while also supporting concepts of sustainability and the circular economy within the fashion sector (Hala Mohamed Soliman, 2022).

The researcher posits that these contemporary trends in macramé constitute a primary academic rationale for the current study; recent literature confirms that the art form is no longer confined to traditional craftsmanship but has become a realm open to innovation, development, and digital integration. These trends also highlight the potential to combine macramé with digital technologies and e-marketing, thereby fostering students' creative production skills and enhancing their ability to engage in creative industries and freelance work.

- **Utilizing the Art of Macramé in Productive Ventures**

The art of macramé is gaining increasing importance in the realm of small and medium-sized productive ventures, owing to the relatively low cost of materials, the ease of mastering its fundamental skills, and the versatility of its product applications. These characteristics have made it a suitable field for establishing creative and innovative productive ventures, particularly amidst the growing interest in cultural and creative industries at both local and global levels (Mahmoud Abdel Ghani Mohamed Halabiya, 2022).

Furthermore, the proliferation of digital platforms, online stores, and social media has provided new marketing channels for macramé-based products, enabling artists and craftspeople to reach broader markets and develop their ventures more sustainably. Studies indicate that contemporary macramé handicrafts serve as a significant avenue for economic empowerment and for fostering a culture of freelancing and entrepreneurship, especially among youth and graduates (Asmah, 2015; Macrame Craft, 2022).

From a creative economy perspective, macramé products exemplify items that combine aesthetic and economic value; artistic skills can be transformed into marketable products that generate economic returns. This aligns with global trends advocating for support for creative industries and the enhancement of their contribution to sustainable development.

The researcher considers the utilization of macramé in productive ventures to be the focal point of the current study, as it bridges the gap between art education and labor market demands by transforming artistic skills into marketable products. Furthermore, integrating digital technologies and e-marketing with the art of macramé can help enhance freelance opportunities for art education students, transforming their artistic expertise into creative ventures that align with the trends of the creative economy and Egypt's Vision 2030.

Section Two: Integrating Digital Technologies into Art Education

- **The Concept of Digital Technologies and Their Applications in Art Education**

Digital technologies constitute a system of tools and software that enable learners to design, develop, process, and produce artworks—either digitally or through hybrid approaches that combine traditional practice with modern techniques. They also facilitate flexible learning environments that encourage experimentation, exploration, and the exchange of artistic experiences more effectively than traditional methods (Zhang, 2022).

Recent studies have confirmed that integrating digital technologies into art education fosters creative thinking, self-directed learning, and artistic problem-solving skills. Furthermore, these technologies offer students broader opportunities to explore and express ideas through multimedia, thereby supporting the development of contemporary artistic experiences aligned with the demands of the digital age (Erişti, 2022; Zhang, 2022).

The researcher maintains that digital technologies are no longer merely supplementary tools in the

educational process; rather, they have become an integrated environment for creativity, learning, and artistic production. Consequently, employing them in teaching macramé is an educational necessity that expands students' creative horizons and bridges traditional artistic practices with the requirements of the digital era.

- **Digital Technologies and Artificial Intelligence in Developing Artistic Designs**

Recent studies indicate that generative artificial intelligence serves as a supportive tool for the creative process rather than a replacement for it; it enables learners to generate diverse initial concepts that can be further developed and modified according to their own artistic vision. It also fosters design thinking by providing a wide range of visual alternatives and solutions that facilitate more efficient design decision-making (Zhang & Wang, 2022; Jiang, 2022).

In the field of art education, AI applications can be leveraged for product design, prototyping, and the development of color and structural compositions; this supports creative and experimental processes while enhancing students' ability to generate innovative design solutions that meet the demands of contemporary creative industries (Ceran, 2022).

The researcher views artificial intelligence as a technological innovation that can be positively integrated into art education programs, provided it serves as a tool to support—rather than replace—human creativity. It can also be utilized to develop preliminary designs for macramé projects, thereby helping to cultivate students' innovation skills and creative production capabilities.

- **The Role of Digital Technologies in Fostering Creative Production and Supporting Creative Industries**

Digital technologies have emerged as a primary driver of creative industries in the modern era, reshaping the methods by which artistic works are produced, marketed, and distributed. This transformation has given rise to new models of creative practice that rely on the integration of artistic skills and digital technologies, thereby enhancing opportunities for innovation, production, and marketing across various creative fields (Allouche, 2022; Erişti, 2022).

Furthermore, digital environments, online marketplaces, and social media platforms have provided artists and artisans with unprecedented opportunities to market their products and reach wider audiences, fostering a growing culture of freelancing and entrepreneurship within artistic and creative sectors. Consequently, possessing digital skills has become a fundamental requirement for active participation in the contemporary creative economy (RMCAD, 2022; Erişti, 2022).

The researcher posits that the true value of digital technologies lies not merely in the development of the artistic product itself, but in their capacity to align the educational process with the demands of the creative economy and the labor market. Thus, integrating digital technologies into the teaching of macramé can help cultivate students' creative production skills and prepare them to capitalize on opportunities in

freelancing and e-marketing—a key objective of the present study.

Section Three: Digital Marketing for Creative Products

- **The Concept and Importance of Digital Marketing for Creative Products**

Rapid advancements in information and communication technologies have led to the emergence of new marketing practices that rely on digital media and the Internet to promote products and services and reach target markets. Digital marketing is defined as the set of marketing activities that utilize digital technologies and the Internet to showcase products, communicate with customers, and manage buying and selling processes in an interactive and efficient manner (Ismail, 2022).

Recent literature indicates that digital marketing has become a fundamental component of success for small creative enterprises. It helps reduce marketing costs, increase market reach, and foster direct customer engagement, while also offering opportunities to customize products according to consumer needs and preferences.

- **Digital Platforms and Marketing Strategies for Artistic Products**

The proliferation of digital platforms and online stores has fundamentally transformed the marketing of artistic and handcrafted products. These platforms serve as effective marketing channels, enabling artists and artisans to showcase their work, interact directly with customers, and manage sales with greater flexibility and efficiency. Social media and online stores are currently among the most widely used tools for marketing creative products.

These strategies are particularly significant for artistic and handcrafted products, as purchasing decisions rely heavily on the product's visual and aesthetic qualities. Consequently, the quality of digital presentation, professional photography, and marketing descriptions play a pivotal role in the success of the marketing process.

- **The Role of E-Marketing in Supporting Freelancing and Creative Industries**

E-marketing serves as a fundamental pillar for supporting freelancing in the digital age, offering individuals independent opportunities to market their products and services without the need for traditional business infrastructure or significant financial investment. Digital platforms have empowered many creative entrepreneurs and artisans to establish their own businesses and reach customers directly.

The researcher posits that e-marketing is no longer merely a means of promoting artistic products; rather, it has become an essential component of the contemporary creative production cycle. It contributes to transforming artistic creations—originally valued solely for their aesthetics—into marketable products with economic value suitable for investment. Furthermore, integrating e-marketing into the teaching of macramé provides students with real-world experience linking design, production, and marketing, while fostering a mindset favorable to freelancing—aligning with the requirements of the creative economy and the objectives of Egypt's Vision 2030.

Section Four: Creative Production

• The Concept of Creative Production

Creative production is a pivotal concept in the fields of art education and the creative industries. It is linked to an individual's ability to transform ideas and mental concepts into products or works characterized by novelty, originality, and both functional and aesthetic value. Creative production reflects the interplay of knowledge, skill, experience, and imagination, enabling the individual to offer solutions or products that transcend the conventional and address real-world demands in innovative ways (Runco & Acar, 2021).

In the context of art education, creative production serves as a key indicator of the educational process's success; it reflects the learner's ability to utilize artistic skills, aesthetic experiences, and various techniques to create works distinguished by excellence and innovation. It also relates to the student's capacity to employ materials and techniques in unconventional ways that enrich the artwork and fulfill its expressive and functional objectives (Mohamed Abdel Hamid Ghanem, 2022). The researcher views creative production as the ultimate outcome of the artistic and technical experiences acquired by the student. Furthermore, it serves as a primary indicator for evaluating the effectiveness of the integrative approach proposed in this study, given its direct link to the student's ability to produce innovative and marketable macramé pieces.

• Characteristics and Indicators of Creative Production

Creative production is defined by a set of characteristics that distinguish it from traditional production; it relies on innovation, renewal, and the delivery of new solutions or products characterized by value and quality. Recent literature confirms that assessing the level of creative output relies on a number of indicators that serve as fundamental criteria for evaluating creative works (Beghetto, 2021; Sternberg, 2022).

▪ Originality

Originality refers to an individual's ability to produce new and unconventional ideas, solutions, or works that differ from prevailing traditional patterns. It is considered a key indicator of creativity, as it reflects the degree of novelty and distinction characterizing the creative product (Runco & Acar, 2021).

In art education, originality is manifested in a student's ability to present innovative artistic approaches and to utilize materials and techniques in unconventional ways that contribute to creating artworks with a distinctive character.

▪ Flexibility

Flexibility represents an individual's ability to shift thinking patterns and move between different ideas and alternatives while addressing problems or executing artworks. It facilitates the generation of diverse solutions and multiple approaches to a single creative situation (Beghetto, 2021).

In the field of macramé, flexibility is demonstrated by the student's ability to modify designs, reorganize artistic elements, and develop execution strategies in accordance with the artwork's requirements.

▪ Fluency

Fluency refers to an individual's ability to generate the greatest possible number of ideas, alternatives, or solutions within a specific timeframe. It is a significant indicator of the richness of creative thinking and the breadth of the individual's experience (Sternberg, 2022). In art education, fluency is evident in the student's ability to generate a large number of design ideas before selecting the most suitable final solution.

▪ Aesthetic Value

Aesthetic value is a fundamental indicator for judging the quality of an artistic product; it relates to the work's success in achieving unity, balance, rhythm, and harmony among its artistic elements. It also reflects the product's capacity for visual impact and its ability to evoke an aesthetic appreciation in the viewer (Hala Mohamed Soliman, 2022).

▪ Marketability

Marketability has emerged as a key indicator of creative production within the context of the creative economy. The success of an artistic product is no longer limited to achieving aesthetic value; it is now also linked to its ability to meet consumer needs and its potential for circulation and marketing across various markets (UNCTAD, 2022). Consequently, a creative product can be viewed as one that combines aesthetic and economic value, thereby supporting opportunities for freelance work and entrepreneurship. The researcher considers the indicators of originality, flexibility, fluency, aesthetic value, and marketability to be integrated dimensions of creative production. These indicators are deemed the most suitable for evaluating the macramé products resulting from the application of the proposed integrative approach; thus, they were adopted as the foundation for developing the artwork evaluation rubric used in this study.

• Fostering Creative Production in Art Education

Contemporary educational trends emphasize that fostering creative production requires flexible learning environments that encourage experimentation, exploration, initiative, and openness to new ideas. Furthermore, providing learners with opportunities to engage in real-world, applied projects effectively enhances their capacity for innovation and production (OECD, 2022).

Art education is particularly well-suited to fostering creative production, as it offers learning experiences that allow students to express themselves freely, experiment continuously, and engage directly with diverse materials and techniques. Additionally, the integration of digital technologies expands opportunities for innovation by providing new tools for design, development, and experimentation (Zhang, 2022).

Recent studies indicate that project-based learning is one of the most effective approaches for fostering creative production; it enables students to transition from merely acquiring knowledge to producing tangible works and projects that address societal needs and labor market demands (Beghetto, 2021). Moreover, integrating art, technology, and e-marketing creates comprehensive learning experiences that support creative thinking and empower students to

produce artistic works combining innovation, quality, and economic value—aligning with the trends of the contemporary creative economy (UNCTAD, 2022). The researcher maintains that fostering creative production cannot be achieved through artistic skills training alone; rather, it requires the creation of integrated learning environments that combine art, technology, and marketing. Against this backdrop, the approach proposed in the current study integrates the art of macramé, digital technologies, and e-marketing into a unified framework aimed at fostering creative output among art education students and preparing them for active participation in the creative industries.

Section Five: Freelancing and Entrepreneurship

• The Concept of Freelancing and Entrepreneurship

Freelancing refers to an individual independently engaging in a professional or productive activity, relying on their own skills, experience, and capabilities to provide products or services directly to beneficiaries in exchange for financial return, without being tied to a permanent job or a specific organization (International Labour Organization, 2022).

Recent literature indicates that freelancing and entrepreneurship are complementary concepts; freelancing serves as a practical pathway for translating entrepreneurial ideas into productive activities and projects grounded in skill, creativity, and innovation (World Economic Forum, 2022). The researcher views freelancing as a promising career path for Art Education graduates, particularly given the growth of the creative industries and the digital economy. Furthermore, fostering a mindset oriented toward freelancing among students enhances their ability to leverage their artistic skills to create independent projects that generate sustainable economic opportunities.

• Characteristics and Skills of Freelancing in the Digital Economy

Digital transformation has reshaped the nature and characteristics of freelancing, making digital technology a fundamental element in project management, client communication, and the marketing of products and services. This shift has given rise to the "digital economy," which relies on leveraging knowledge and digital technologies to generate economic value (World Bank, 2022).

Success in freelancing requires a set of integrated skills, most notably:

- Technical and specialized skills.
- Creativity and innovation skills.
- Planning and time management skills.
- Digital marketing skills.
- Communication and client management skills.
- Digital technology proficiency.
- Problem-solving and decision-making skills.

Recent studies confirm that possessing these skills contributes to increased chances of success and sustainability in freelance work, while also helping individuals adapt to the rapid changes characterizing the digital economy (European Commission, 2022).

The researcher holds the view that freelance-related skills have become an integral part of the requirements for preparing art education students in the digital age—particularly given the expanding opportunities to market artistic products via online platforms—thereby necessitating the integration of these skills into the educational experiences provided to students.

• The Role of University Education and the Arts in Fostering a Culture of Freelancing

Universities are increasingly expected to go beyond the mere transmission of academic knowledge; they must prepare students for professional life and enable them to adapt to the evolving demands of the labor market. Consequently, fostering a culture of freelancing and entrepreneurship within higher education institutions has become crucial. This is achieved by developing curricula and educational programs that link academic learning to real-world, practical applications (UNESCO, 2022).

In the realm of art education, the arts and creative industries hold significant potential for supporting a freelancing culture, as they rely on creative and productive skills that can be transformed into marketable products and projects. Artistic crafts, handmade goods, and creative designs have emerged as promising areas for establishing small and medium-sized enterprises (SMEs), thereby contributing to job creation and generating viable economic returns (UNCTAD, 2022).

The researcher posits that art education possesses unique attributes that enable it to foster a freelancing culture among students, given the productive and creative experiences it offers—experiences that can be translated into tangible projects. Furthermore, integrating the art of macramé with digital technologies and e-marketing serves as a practical model illustrating the link between art education and freelancing; it provides students with the opportunity to engage in production and marketing within an educational setting that mirrors the professional world. The researcher adopted "attitude toward freelancing" as a dependent variable in this study, based on the premise that attitudes are key indicators of an individual's readiness to adopt or pursue specific behaviors in the future. Given that the goal of the proposed integrative approach is not limited to developing artistic and creative skills—but extends to fostering students' awareness of the potential to apply these skills in marketable, productive projects—it has become essential to measure the program's impact on shaping their attitudes toward self-employment.

Section Six: The Creative Economy and Egypt's Vision 2030

• The Concept of the Creative Economy and Creative Industries

The creative economy is defined as the set of economic activities based on individual creativity, skills, and talents used to produce goods and services with cultural, artistic, or intellectual content. These activities contribute to job creation, economic growth, and sustainable development (UNCTAD, 2022).

Recent international reports indicate that creative industries have become one of the fastest-growing sectors globally, increasingly contributing to the GDP of many nations and providing millions of jobs—particularly for youth and professionals in cultural, artistic, and creative fields (UNESCO, 2022; UNCTAD, 2022).

The researcher views the art of macramé as a field that can be integrated into the creative industries, given its aesthetic and productive qualities, which allow artistic skills to be transformed into products of economic value. Furthermore, linking macramé instruction to creative economy concepts helps broaden students' awareness regarding opportunities to capitalize on their creative abilities and transform them into marketable, productive ventures.

- **The Creative Economy and Digital Transformation**

Artificial intelligence applications, digital design software, and e-commerce platforms have enhanced the efficiency of creative processes and created new opportunities for creators and artisans to develop and market their products more effectively. Digital skills have become a fundamental requirement for working in contemporary creative industries; success no longer relies solely on artistic skill but is also linked to the ability to leverage technology in design, production, and marketing (Organization for Economic Co-operation and Development [OECD], 2022). The researcher posits that digital transformation is a key factor supporting the success of the integrative approach proposed in this study; it enables students to utilize digital technologies to develop macramé designs and market their products via online platforms, thereby enhancing their ability to integrate into the contemporary creative economy.

- **The Creative Economy and Egypt's Vision 2030**

Egypt Vision 2030 serves as the strategic framework for sustainable development in the Arab Republic of Egypt. It aims to build a competitive economy driven by knowledge, innovation, and technology, while enhancing the roles of education, scientific research, and entrepreneurship in achieving comprehensive development (Cabinet of Ministers, 2022).

The objectives of the current research align with the directions of Egypt Vision 2030 in several key areas: developing students' creative and digital skills, fostering a culture of freelancing, supporting entrepreneurship, and leveraging technology to develop artistic products. These efforts contribute to preparing graduates capable of actively participating in a knowledge- and creativity-based economy.

Furthermore, employing the art of macramé within a framework that integrates digital technologies and e-marketing aligns with the state's initiatives to support small businesses and creative industries, as well as to prepare young people to capitalize on opportunities offered by the digital economy in the modern labor market (Ministry of Planning and Economic Development, 2022).

The researcher posits that the proposed integrative approach goes beyond merely developing students' artistic skills; it prepares them for active participation

in the creative economy by fostering their capabilities in innovation, production, marketing, and freelancing. This approach also aligns with Egypt Vision 2030 targets regarding digital transformation, entrepreneurship, and sustainable development, thereby lending the research a national and developmental dimension that transcends the scope of traditional artistic practice.

Research Procedures

- **Research Methodology:**

The current study employed a quasi-experimental method, as it was best suited to the research's nature and objectives. The study aimed to investigate the effectiveness of an integrated approach—combining macramé art, digital technologies, and e-marketing—in developing creative production skills and attitudes toward freelancing among Art Education students.

An experimental design involving two equivalent groups—an experimental group and a control group—was utilized, with both pre- and post-testing administered to both groups.

- **Research Sample:**

The sample was selected from third-year students in the Art Education Department at the Faculty of Specific Education. These students were chosen because they study macramé art as part of the "Artistic Crafts" course, aligning with the study's nature and objectives. The main sample consisted of 80 students, selected randomly and divided into two equivalent groups:

- Experimental Group: 40 students who studied using the program based on the integrated approach (macramé art, digital technologies, and e-marketing).
- Control Group: 40 students who studied using the conventional method typically employed for teaching macramé art.

Equivalence between the two groups was verified prior to the program's implementation regarding the research variables: creative production skills and attitudes toward freelancing.

- **Research Instruments:**

The researcher utilized the following tools:

- 1- The proposed program

- Designing a proposed enrichment unit based on an analysis of the "Artistic Crafts" course syllabus.

An educational program based on an integrative approach combining the art of macramé, digital technologies, and e-marketing. The researcher developed the proposed program by designing an enrichment unit based on an analysis of the "Artistic Crafts (3)" course syllabus—taught to third-year students in the Art Education Department at the Faculty of Specific Education—which includes the study of macramé. It was found that the current content focuses primarily on the artistic and technical aspects of executing knots, weaving structures, and combining various materials, while lacking direct inclusion of skills related to digital design, e-marketing, or the application of artificial intelligence in artistic product development. In developing the enrichment unit, care was taken to maintain the course's general objectives

and intended learning outcomes while incorporating new educational experiences related to digital design, artificial intelligence, e-marketing, and freelancing. Aligned with the research objectives, the proposed enrichment unit was not limited to developing the technical skills required to create macramé pieces; it also aimed to foster dimensions of creative production—a key dependent variable in the study. To define these dimensions, the researcher drew upon literature and studies concerning creativity, artistic production, and creative industries. These sources confirmed that evaluating the quality of a creative product relies on a set of integrated indicators:

originality, flexibility, fluency, aesthetic value, and marketability. To achieve this, the unit's content and educational activities were designed to provide students with opportunities to engage in creative thinking, experimentation, development, and self-evaluation throughout the design, production, and marketing stages. Furthermore, the integration of digital technologies, artificial intelligence tools, and e-marketing was incorporated to support and foster these dimensions in a holistic manner. The following table illustrates the alignment between the enrichment unit's various sessions and the dimensions of creative production targeted in the current study.

Table (1): Alignment of sessions with creative production dimensions

Marketability	Aesthetic Value	Fluency	Flexibility	Originality	Encounters
-	-	✓	✓	✓	1-2
-	✓	✓	✓	✓	3-4
-	✓	✓	✓	✓	5
✓	✓	-	✓	✓	6-8
✓	✓	-	-	-	9
✓	✓	-	-	-	10

The unit aimed to develop a range of technical, digital, and marketing skills that contribute to enhancing creative output and supporting the shift towards freelancing, by providing applied learning experiences

that mirror real-world practices in the creative industries. In this context, the intended learning outcomes for the unit were defined as shown in the following table:

Table (2): Intended Learning Outcomes of the Unit

Learning Outcomes	Domain
Understanding the relationship between macramé, digital technologies, e-marketing, and the creative economy	Knowledge and understanding
Creating innovative, high-quality macramé pieces	Technical Skills
Utilizing digital software and artificial intelligence in design	Digital Skills
Showcasing and marketing products via digital platforms	Marketing Skills
Promoting a shift towards freelancing and entrepreneurship	Attitudes
Fostering originality, flexibility, fluency, aesthetic value, and marketability	Creative Production

Teaching and Learning Strategies Used in the Enrichment Unit

In implementing the enrichment unit, the researcher employed a set of teaching and learning strategies aligned with the nature of the proposed integrative approach. These strategies contribute to achieving the unit's objectives and fostering students' creative output and entrepreneurial mindset. They were selected for the opportunities they provide for experimentation, innovation, and hands-on practice, all of which suit the nature of the artistic and productive activities included in the unit.

Educational Activities Accompanying the Unit

The unit comprised a range of educational and practical activities aimed at integrating the art of macramé with digital technologies and e-marketing. Key activities included:

- Analyzing examples of contemporary macramé products.
- Generating design ideas using artificial intelligence applications.
- Creating preliminary digital product designs.
- Crafting innovative macramé pieces.

- Developing products by combining various materials.
- Photographing products and creating marketing content for them.
- Creating a digital platform or online store to showcase products.
- Displaying products and having them evaluated by peers and specialists.
 - Educational aids and technologies used
- Computers, smartphones, the Internet, Canva, Photoshop, ChatGPT or generative AI tools, an online platform for showcasing products, and macramé materials and tools.

Assessment methods

- Pre-assessment
 - Creative output evaluation rubric.
 - Scale measuring attitudes toward freelancing.
 - Formative assessment
 - Performance monitoring during implementation.
 - Evaluation of preliminary designs.
 - Evaluation of interim activities.
 - Electronic portfolios.
 - Summative assessment
 - Evaluation of the final artistic product.
 - Evaluation of the marketing presentation.
 - Post-administration of research instruments.
- Experimental group participants.

Final Form of the Proposed Enrichment Unit

In light of the validation results and the constructive comments and suggestions provided by the reviewers, the researcher made the necessary modifications to the proposed enrichment unit. These adjustments—covering the phrasing of certain operational objectives, the development of educational activities, and the enhanced integration of digital technologies, artificial intelligence tools, and e-marketing—aimed to ensure greater alignment between the unit's content and the research objectives and variables. Upon incorporating the proposed modifications, the enrichment unit reached its final form, making it suitable for implementation with the experimental group. It was characterized by comprehensiveness and integration, and it took into account the specific characteristics of third-year Art Education students. Furthermore, its content, activities, and assessment methods aligned with the research objectives—namely, developing creative production skills and fostering a positive attitude toward freelance work, in light of the requirements of the creative economy and Egypt's Vision 2030.

Consequently, the researcher determined that the finalized enrichment unit provided a suitable educational and practical framework for testing the effectiveness of the proposed integrative approach—combining macramé art, digital technologies, and e-marketing. This necessitated the development of the research instruments required to measure the approach's impact on the research variables and to verify the research hypotheses.

Research Instruments

To achieve the research objectives, answer its questions, and test its hypotheses, the researcher developed a set of instruments suited to the nature of the variables under study. These instruments consisted of:

1. A creative output evaluation rubric: designed to measure students' creative performance in executed artistic products based on the dimensions of originality, flexibility, fluency, aesthetic value, and marketability.
2. A scale for measuring attitudes toward freelance work: designed to assess the impact of the proposed enrichment unit on fostering students' attitudes toward freelancing and leveraging their artistic skills to launch future creative projects.

The development of these research instruments followed a series of systematic, scientific steps to ensure adequate levels of validity and reliability, thereby guaranteeing the accuracy of the findings. A detailed description of the development procedures for each instrument follows.

Creative Production Evaluation Rubric

- Purpose of the Rubric

The researcher developed a rubric to evaluate creative production, aiming to measure the level of creative output among third-year students in the Art Education Department regarding the artworks created through the proposed enrichment unit. It also aims to assess the effectiveness of an integrated approach—combining macramé art, digital technologies, and e-marketing—in developing the students' creative production skills.

In constructing the rubric, the researcher drew upon educational and artistic literature, as well as prior studies concerning creativity, artistic production, and creative industries. Consideration was also given to the nature of the artworks targeted in this study, leading to the identification of specific dimensions that serve as key indicators for assessing the level of creative production.

- Defining the Rubric Dimensions

Based on the theoretical framework and previous studies, the researcher identified five key dimensions for the creative production evaluation rubric:

Originality, Flexibility, Fluency, Aesthetic Value, and Marketability.

These dimensions were selected due to their direct relevance to the nature of the artworks produced within the enrichment unit and their capacity to comprehensively measure the creative, artistic, and marketing aspects of the product.

Description of Rubric Dimensions

- Dimension 1: Originality

This refers to the distinctiveness and novelty of the design concept, as well as the extent to which it avoids imitation or the direct copying of common models.

- Dimension 2: Flexibility

This refers to the student's ability to employ multiple approaches or design alternatives during the design and execution stages.

- Dimension 3: Fluency

This refers to the student's ability to generate a diverse range of ideas and design concepts prior to arriving at the final product.

- **Fourth Dimension: Aesthetic Value**

This refers to the extent to which the artistic product successfully achieves aesthetic and formal qualities.

- **Fifth Dimension: Marketability**

This refers to the product's suitability for circulation and sale within creative markets.

Preliminary Draft of the Card

Based on the aforementioned dimensions, the researcher drafted the initial version of the creative output evaluation rubric, comprising 24 indicators distributed across the rubric's five dimensions.

Scoring System

The researcher adopted a five-point scale to assess performance levels for each indicator; consequently, the total score ranged from a minimum of 24 to a maximum of 120 points.

Rubric Validity

To verify the rubric's validity, the researcher presented the initial draft to a panel of experts specializing in:

- Art education curricula and teaching methods; art crafts; art design; and educational technology.

They were asked to provide their views on:

- The alignment of the dimensions with the research objectives.
- The suitability of the indicators for their respective dimensions.
- The soundness of the linguistic and technical phrasing.
- The rubric's comprehensiveness regarding all aspects of creative output.

The expert agreement rate regarding the rubric's validity was 96.67%, indicating a high degree of face and content validity.

Modifications Based on Expert Feedback

In light of the experts' comments, the researcher undertook the following:

- Rephrasing certain indicators for greater clarity.
- Merging similar indicators.
- Adding an indicator regarding the product's visual appeal for digital display.
- Modifying certain descriptions related to marketability.

Thus, the final version of the rubric consists of 24 indicators.

Rubric Reliability

To verify the reliability of the rating scale, the researcher employed an inter-rater reliability method; three experts independently evaluated a sample of artistic products, and the inter-rater agreement coefficient was calculated using Cooper's formula. The average inter-rater agreement coefficient was 0.91—a high value indicating that the scale possesses a high degree of reliability and is suitable for field application.

Final Version of the Creative Product Evaluation Scale
Upon completing the development of the creative product evaluation scale and verifying its validity and reliability, the final version was established as shown in Appendix (2). The scale comprises five main dimensions—originality, flexibility, fluency, aesthetic value, and marketability—and includes a total of 24 indicators distributed across these dimensions based on the results of the expert review.

In its final form, the scale serves as a valid and reliable tool for assessing the level of creative production among research participants—specifically through the artistic products created during the implementation of the proposed enrichment unit. It enables the measurement of progress in the targeted dimensions of creative production and reveals the impact of an integrated approach combining macramé art, digital technologies, and e-marketing on the development of this variable.

Consequently, the scale is ready for pre- and post-testing with both the experimental and control groups, paving the way for necessary statistical processing and the analysis and interpretation of results in light of the research objectives and hypotheses.

Scale of Attitude Toward Freelancing:

- **Purpose of the Scale**

The researcher developed a scale to measure attitudes toward freelancing, aiming to assess the attitudes of third-year Art Education students before and after the implementation of a proposed enrichment unit. The study also sought to determine the effectiveness of an integrative approach—combining macramé art, digital technologies, and e-marketing—in fostering these attitudes.

Attitude toward freelancing is a key variable in preparing students for the modern labor market; it reflects their willingness to rely on their artistic skills and capabilities to launch independent creative projects and generate economic returns from them.

- **Defining the Scale's Dimensions**

Based on the theoretical framework and prior studies regarding freelancing, entrepreneurship, and the creative economy, the researcher identified the following primary dimensions for the scale:

1. Awareness of the importance of freelancing.
2. Desire to engage in freelancing.
3. Confidence in the ability to launch an art-based project.
4. Attitude toward utilizing digital technologies and e-marketing in freelancing.

- **Description of the Scale's Dimensions**

- **Dimension 1: Awareness of the importance of freelancing**

Measures the student's understanding of the significance of freelancing and its role in creating job opportunities and achieving professional and economic independence.

- **Dimension 2: Desire to engage in freelancing**

Measures the student's readiness and willingness to pursue freelancing in the future and to leverage their artistic skills in doing so.

- **Dimension 3: Confidence in the ability to launch an art-based project**

Measures the student's confidence in their ability to produce and market artistic products and to transform them into a small business or an independent professional venture.

- **Fourth Dimension: Attitude towards utilizing digital technologies and e-marketing**

This dimension measures the extent to which the student is convinced of the importance of digital

technologies and online platforms in supporting freelance work and marketing artistic products.

- Initial formulation of the scale

Based on the aforementioned dimensions, the researcher formulated a set of statements to measure attitudes toward freelance work. The initial version comprised (32) statements distributed across the scale's four dimensions.

The following factors were considered when formulating the statements:

- Clarity and ease of understanding.
- Relevance to the research objectives.
- A mix of positive and negative statements.
- Suitability for the level of Art Education students.

Scale instructions

This scale aims to assess your attitudes toward freelance work. There are no right or wrong answers; please read each statement carefully and indicate your level of agreement.

Scale Validity

To verify the validity of the scale, the researcher presented the initial draft to a panel of experts specializing in:

- Art Education.
- Curricula and Teaching Methods.
- Educational Psychology.
- Educational Technology.

This was done to verify:

- The suitability of the dimensions regarding the research objectives.
- The soundness of the statement wording.
- The clarity of the instructions.
- The appropriateness of the statements for Art Education students.

The expert agreement rate regarding the scale's validity was 95.83%, indicating a high degree of face validity and content validity.

Scale Reliability

To verify the reliability of the scale, the researcher administered it to a pilot sample of Art Education students distinct from the main research sample. The reliability coefficient was then calculated using Cronbach's Alpha.

The reliability coefficient was 0.89—a high value indicating an adequate level of reliability, making the scale suitable for field application. The Final Version of the Scale

In light of the validity and reliability procedures, as well as the modifications made based on the feedback from the panel of experts, the scale measuring attitudes toward freelance work is now finalized and ready for administration to the research sample. The aim is to measure changes in participants' attitudes toward freelance work—both before and after the implementation of the proposed enrichment unit—and to assess the impact of an integrated approach combining the art of macramé, digital technologies, and e-marketing on developing this variable. Following the completion of the scale's development and the verification of its validity and reliability, the final version—presented in Appendix (3)—is ready for pre- and post-testing with both the experimental and control

groups, paving the way for the statistical analyses required to test the research hypotheses.

Administration Procedures

The research procedures followed a series of organized steps aimed at verifying the effectiveness of an enrichment unit—based on the integration of macramé art, digital technologies, and e-marketing—in developing creative production skills and attitudes toward freelancing among Art Education students. These steps were as follows:

- The researcher began by developing the proposed enrichment unit, drawing upon the theoretical framework and prior studies related to macramé art, digital technologies, e-marketing, and the creative economy. She also developed the research instruments: a creative production evaluation rubric and a scale to measure attitudes toward freelancing.
- Subsequently, the enrichment unit and research instruments were submitted to a panel of experts specializing in Art Education, art crafts, curricula and teaching methods, and educational technology. This step aimed to verify their suitability for implementation and their alignment with research objectives, allowing for necessary modifications based on the experts' feedback and suggestions.
- The researcher then selected the study sample from third-year students in the Art Education Department at the Faculty of Specific Education. The sample consisted of 80 students, divided into two equivalent groups: an experimental group of 40 students and a control group of 40 students.

Before the experiment began, the research instruments were administered as a pre-test to both groups to assess their baseline levels of creative production and attitudes toward freelancing, and to ensure the groups were equivalent regarding the research variables.

Following this, the proposed enrichment unit was implemented with the experimental group over the designated timeframe, while the control group studied macramé art using the standard teaching methods employed for the "Art Crafts (3)" course. The experiment involved training members of the experimental group to utilize digital technologies and artificial intelligence tools in designing innovative macramé products. Additionally, they were trained to create digital marketing content and showcase their products via an online store and dedicated social media pages. Following the completion of the enrichment unit, post-test research instruments were administered to both groups; the data were then collected and scores recorded in preparation for statistical analysis, as well as the derivation and interpretation of results in light of the research objectives and hypotheses.

Results and Discussion

Upon completing the administration of research instruments and the statistical processing of data, the researcher presented, analyzed, and interpreted the findings in light of the theoretical framework and relevant prior studies, as follows:

▪ Results of the First Hypothesis:

The first hypothesis states:

"There is a statistically significant difference at the (0.05) level between the mean scores of the experimental and control groups on the post-test

administration of the creative product assessment scale, in favor of the experimental group."

To verify this hypothesis, the researcher employed an independent samples t-test to compare the mean scores of the experimental and control groups on the post-test administration of the creative product assessment scale.

Table (3): Results of the independent samples t-test regarding differences between the experimental and control groups on the post-test administration of the creative product assessment scale.

Group	N	Mean	St. dev.	t	Sig.
Experimental	40	101.35	8.42	11.87	0.001
Control	40	76.48	10.11		

The preceding table shows that the mean score of the experimental group on the post-test of the creative product assessment scale was 101.35, while the mean score of the control group was 76.48—a difference of 24.87 points in favor of the experimental group. The calculated t-value was 11.87, which exceeds the critical t-value at the 0.05 significance level; furthermore, the associated significance level was 0.001 (less than 0.05), indicating a statistically significant difference between the two groups on the post-test of the creative product assessment scale in favor of the experimental group. Accordingly, the first hypothesis is accepted; it states that there is a statistically significant difference

between the mean scores of the experimental and control groups on the post-test of the creative product assessment scale, in favor of the experimental group.

▪ Results of the Second Hypothesis:

The second hypothesis states:

"There is a statistically significant difference at the 0.05 level between the mean scores of the experimental group on the pre-test and post-test of the creative product assessment scale, in favor of the post-test."

To verify this hypothesis, the researcher used a paired-samples t-test to compare the mean scores of the experimental group on the pre-test and post-test of the creative product assessment scale.

Table (4): Results of the paired-samples t-test regarding the differences between the pre-test and post-test for the experimental group on the creative product assessment scale.

Group	N	Mean	St. dev.	t	Sig.
Experimental	40	58.63	9.27	24.31	0.001
Control	40	101.35	8.42		

The preceding table shows that the mean score of the experimental group members on the pre-test of the creative production assessment rubric was 58.63, whereas it rose to 101.35 on the post-test, representing a difference of 42.72 points.

The calculated t-value was 24.31, which is statistically significant at the 0.05 level; the significance level was 0.001—lower than the level adopted for the study—indicating a statistically significant difference between the mean scores of the experimental group members on the pre- and post-tests, in favor of the post-test.

Consequently, the second hypothesis is accepted; it states that there is a statistically significant difference between the mean scores of the experimental group

members on the pre- and post-tests of the creative production assessment rubric, in favor of the post-test.

▪ Results of the Third Hypothesis:

The third hypothesis states:

"There is a statistically significant difference at the 0.05 level between the mean scores of the experimental and control group members on the post-test of the 'Attitude toward Freelancing' scale, in favor of the experimental group."

To verify this hypothesis, the researcher used the Independent Samples T-Test to compare the mean scores of the experimental and control group members on the post-test of the 'Attitude toward Freelancing' scale.

Table (5): Results of the Independent Samples T-Test regarding differences between the experimental and control groups on the post-test of the 'Attitude toward Freelancing' scale.

Group	N	Mean	St. dev.	t	Sig.
Experimental	40	129.42	11.38	10.76	0.001
Control	40	98.15	14.37		

The preceding table shows that the mean score of the experimental group on the post-test of the "Attitude toward Freelancing" scale was 129.42, whereas the mean score of the control group was 98.15—a difference of 31.27 points in favor of the experimental group.

The calculated t-value was 10.76, which is statistically significant at the 0.05 level (with a significance level of 0.001, falling below the threshold adopted for the

study). This indicates a statistically significant difference between the mean scores of the experimental and control groups on the post-test of the "Attitude toward Freelancing" scale, favoring the experimental group. Consequently, the third hypothesis is accepted; it states that there is a statistically significant difference between the mean scores of the experimental and control groups on the post-test of the "Attitude toward Freelancing" scale, in favor of the experimental group.

▪ Results of the Fourth Hypothesis:

The fourth hypothesis states:

"There is a positive correlation, statistically significant at the 0.05 level, between the scores of the experimental group members on the Creative Production Evaluation Form and their scores on the 'Attitude toward Freelancing' scale."

Table (6): Correlation coefficients between creative production and attitude toward freelancing among experimental group members.

Variable	The trend towards freelancing	Sig.
Creative Production	0.82	0.001

The preceding table shows that the Pearson correlation coefficient between creative output and the attitude toward freelancing was 0.82. This is a high positive value that is statistically significant at the 0.05 level (with a significance level of 0.001, which is below the threshold adopted for the study). This result indicates a strong positive correlation between the level of creative output and the attitude toward freelancing among members of the experimental group; essentially, as students' creative output increased, so did their positive attitude toward freelancing, and vice versa. Consequently, the fourth hypothesis is accepted, confirming the existence of a statistically significant positive correlation between the experimental group members' scores on the creative output assessment rubric and their scores on the scale measuring attitudes toward freelancing.

Summary of Research Results

The results demonstrate the effectiveness of an integrative approach—combining macramé art, digital technologies, and e-marketing—in developing both creative output skills and attitudes toward freelancing among art education students.

The findings also confirm that incorporating digital technologies and artificial intelligence tools into art activities broadens students' creative thinking horizons and supports their ability to create high-quality, distinctive, and marketable art products. Furthermore, the results highlight the importance of integrating e-marketing into art education curricula, given its role in strengthening students' connection to the labor market and raising their awareness of freelancing opportunities and creative industries. Finally, the results reveal a strong correlation between creative output and the attitude toward freelancing, suggesting that fostering students' creative capabilities can serve as an effective pathway to encouraging entrepreneurship and freelancing within artistic fields. Overall, the research findings demonstrated the effectiveness of an integrative approach—combining the art of macramé with digital technologies and e-marketing—in developing both creative production skills and attitudes toward freelancing among art education students. Statistical analysis confirmed significant differences favoring the experimental group on both the creative production assessment rubric and the scale measuring attitudes toward freelancing. Furthermore, a strong positive correlation was found between the two variables, reflecting the success of the proposed

To verify this hypothesis, the researcher used the Pearson Correlation Coefficient to examine the nature of the relationship between the experimental group members' scores on the Creative Production Evaluation Form and their scores on the "Attitude toward Freelancing" scale during the post-test.

enrichment unit in achieving its objectives. These results indicate that integrating digital technologies, artificial intelligence tools, and e-marketing into macramé instruction enhanced students' innovation, design, and production capabilities. It also raised their awareness of the potential to transform artistic skills into marketable production projects, thereby supporting their inclination toward freelancing and entrepreneurship. The findings underscore the importance of adopting contemporary educational approaches that transcend traditional artistic practice by linking art, technology, and the economy. Such approaches align with the demands of the creative economy and digital transformation, helping to prepare graduates who are more competitive and capable of actively participating in creative industries. Based on these results, the researcher presents a set of recommendations and research proposals designed to help develop art education programs, strengthen their role in supporting the creative economy and entrepreneurship, and advance the goals of Egypt's Vision 2030.

Research Recommendations

In light of the research findings, the researcher makes the following recommendations:

1. Develop arts and crafts curricula in Faculties of Specific Education to align with the requirements of the creative economy.
2. Integrate digital technologies and artificial intelligence tools into art education instruction.
3. Incorporate e-marketing into art education teacher preparation programs.
4. Establish online platforms to showcase and market students' artistic products.
5. Foster a culture of freelancing and entrepreneurship within higher education institutions.
6. Encourage students to undertake productive art projects that address market needs.
7. Leverage creative industries to enhance self-employment opportunities for graduates.
8. Conduct specialized training programs in digital design and e-marketing for art education students.
9. Strengthen partnerships between Faculties of Specific Education and creative industry institutions.

10. Align the development of art education programs with the objectives of Egypt's Vision 2030.

Appendix
Samples of work by students in the experimental and control groups

	Experimental group	Control group
1.		
2.		
3.		
4.		

5.		
6.		
7.		
8.		
9.		

10.		
11.		
12.		
13.		
14.		

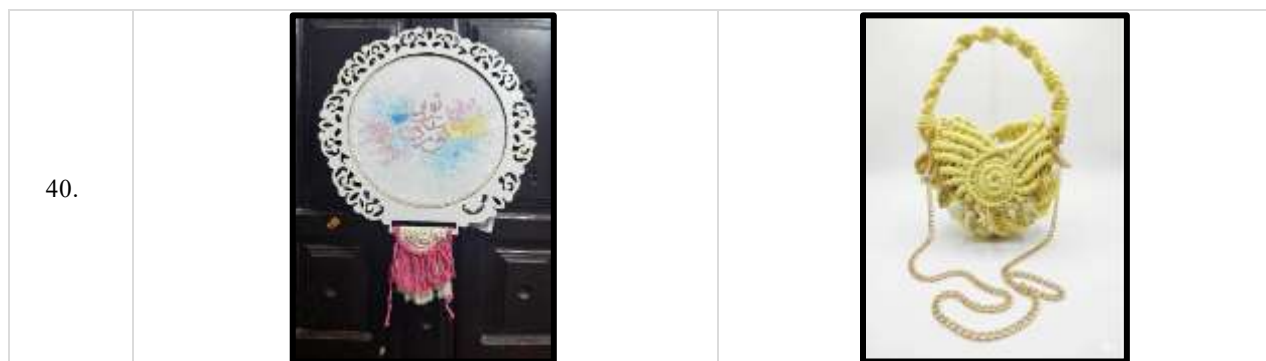
15.		
16.		
17.		
18.		
19.		

20.		
21.		
22.		
23.		
24.		

25.		
26.		
27.		
28.		
29.		

30.		
31.		
32.		
33.		
34.		

35.		
36.		
37.		
38.		
39.		



References

- Ahmed Mohamed El-Sayed. (2020). The Aesthetics of Macramé Art and Its Utilization in Enhancing Women's Clothing. *Journal of Home Economics*, Menoufia University.
- A Proposed Framework for Digital Technical Competencies and 21st-Century Requirements for Art Education Teachers in Light of Their Training Needs. (2022).
- Anantrasirichai, N., Zhang, F., & Bull, D. (2022). Artificial Intelligence in Creative Industries: Advances Prior to 2022. arXiv.
- British Council Egypt. (2022). Cluster on Creative Industries in Egypt. British Council Egypt.
- Cabinet of Ministers. (2022). Egypt Vision 2030: Updated Version.
- Ceran, S. (2022). Artificial Intelligence Literacy in Visual Arts Education.
- Deb, S. K. (2022). Promoting Handicraft Family Business through Digital Marketing toward Sustainable Performance.
- El-Sayed, A. M. (2022). Creating contemporary fashions using the art of macramé in light of sustainable fashion trends. *International Design Journal*.
- Erişti, S. D. B. (2022). Integrating Digital Technologies and AI in Art Education: Pedagogical Competencies and the Evolution of Digital Visual Culture.
- Faryal Saeed Ahmed Salloum. (2022). Integrating Plastic Arts to Achieve Formative and Aesthetic Values in Contemporary Macramé-Based Fashion Accessories Created on Mannequins.
- Fiber Arts Alliance. (2022). *Macramé*. Retrieved from <https://www.fiberartsalliance.org>
- Greater Manchester University. (2022). Creative Economy: How Digital Arts Degrees Foster Industry Innovation.
- Harvey, V. (2021). *Macramé: The Art of Creative Knotting*. New York: Van Nostrand Reinhold.
- Ibrahim, F. H. (2022). Rethinking Macramé Instruction: A Mathematical Approach to Textile Education.
- Iman Gaber Khalaf. (2021). The Aesthetic Values of Macramé Art and Their Impact on Enriching Artistic Crafts and Applied Clothing. *International Journal of Design, Fashion, and Textiles*.
- International Labour Organization (ILO). (2022). World Employment and Social Outlook.
- Ismail, Mohamed. (2022). E-marketing and Its Role in the Success of Small Enterprises and Handicrafts.
- Hala Mohamed Soliman. (2022). Creating Contemporary Fashion Using the Art of Macramé in the Context of Sustainable Fashion. International Journal of Design.
- Jiang, Y. (2022). Generative AI in Art Education: A Systematic Review.
- Khalaf, E. G. (2021). The aesthetic values of macramé art in enriching university students' textile products. *International Design Journal*.
- Leslie, C. A. (2021). *Needlework Through History: An Encyclopedia*. Greenwood Publishing Group.
- Macrame Craft: A Valuable Contribution to Traditional Handicraft Sector. (2022).
- Mahmoud Abdel-Ghani Mohamed Halabiya. (2022). Utilizing Macramé Art to Create Women's Clothing as a Basis for a Small Enterprise. Journal of Research in Specific Education Fields.
- Mohamed Ahmed Mohamed Abdel-Ghani. (2022). Employing Macramé Art to Create Contemporary Artistic Crafts Based on the Aesthetic and Formative Values of Textile Knots. Journal of Research in Specific Education Fields, Minia University.
- Mohamed Abdel-Hamid Ghanem. (2022). Creativity and Artistic Production in Contemporary Art Education.
- Ministry of Planning, Economic Development and International Cooperation. (2022). Egypt Vision 2030. Government of Egypt.
- Naglaa Farouk Ragab Kasba. (2022). The Potential of Utilizing the Formative Values of Macramé Art to Enrich Women's Fashion Accessories.
- OECD. (2022). Creative Thinking in Education.
- Organisation for Economic Co-operation and Development (OECD). (2022). The Digital Transformation and the Creative Economy.
- Runco, M. A., & Acar, S. (2021). Creativity and Creative Thinking.

31. Singh, N. (2022). Leveraging Digital Marketing to Boost Handicraft Businesses.
32. Sternberg, R. J. (2022). The Nature of Human Creativity.
33. Tatter Guild. (2022). *A Brief History of Macramé*. Retrieved from <https://tatter.org>
34. Turner, J. C., & van de Griend, P. (2021). *History and Science of Knots*. Singapore: World Scientific Publishing.
35. UNESCO. (2022). Higher Education and Future Skills Development.
36. UNESCO. (2022). Re|Shaping Policies for Creativity: Addressing Culture as a Global Public Good.
37. United Nations Conference on Trade and Development (UNCTAD). (2022). Creative Economy Outlook 2022.
38. Wang, Y. (2022). Creative Transformation of Cultural Heritage Handicraft Products in the Digital Age.
39. World Bank. (2022). Digital Development Report 2022.
40. World Economic Forum. (2022). The Future of Jobs Report.
41. Zhang, C. (2022). Use of Digital Technologies in the Process of Teaching Art Education.
42. Zhang, L., & Wang, C. X. (2022). AI in Design Education at College Level: Educators' Perspectives and Challenges.