



Design and Fabrication of Brooch Jewellery for the Student Representative Council of AsanSka University College of Design and Technology, Ghana

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Article Info

Impact Factor (RSIF): 8.29

Volume: 02

Issue: 02

March-April 2026

Received: 21-12-2025

Accepted: 23-01-2026

Published: 25-02-2026

Page No: 01-11

Abstract

This study design and fabricate brooch jewellery for the Student Representative Council (SRC) of AsanSka University College of Design and Technology (AUCDT), exploring both traditional and contemporary approaches. The research addresses the absence of special insignia at the SRC induction ceremony, aiming to create a significant representation that would serve as a symbol of power, identity, and organisational values. The qualitative research approach was employed, alongside the studio-based research method; required data was gathered by observing, interviewing, and analysing documents. The major tasks were to explore cultural and social issues that affect brooch designs and to determine appropriate materials, tools, and techniques to make a prototype. The results showed that brooches could serve as an outlet of cultural symbolism, and the design concepts, such as heritage motifs and social identity, were used to develop various designs. The brooch jewellery used multiple elements, including the *Gye Nyame* symbol, diamond, book, leaf, gear, symbolising resilience, knowledge, growth and innovation. The focused production gave priority to sustainability and low cost, with such techniques as piercing and soldering. This research is a contribution to the knowledge on jewellery design that provides an effective model to design symbolic accessories and improve SRC ceremonies at AUCDT.

Keywords: 3D Technology, Emblem, Engraving, Filigree, Sustainability

Introduction

Jewellery has been a part and parcel of human culture for thousands of years and has been used to show status, wealth and as a way of expressing oneself. Traditionally, jewellery has been mainly linked to such objects as necklaces, earrings and bracelets. This has, however, changed significantly in recent years with the perception and consumption of the brooch jewellery. The modern man is moving towards a direction of wearing jewellery as a form of self-expression, identity and fashion. This trend has seen the demand of brooch specific jewellery sets increase exponentially to suit the specific tastes and preferences of men (Scarbrick, 2007) ^[14].

The production and design of the brooch jewellery offer challenges and opportunities. In contrast to conventional jewellery that usually focuses on the delicacy and intricate designs, brooch jewellery is usually placed more on boldness, simplicity, and functionality (Tait, 2008) ^[17]. The materials applied, the aesthetics of design and the way it is made should all be in line with the changing tastes of the modern brooch consumer. The thesis talks about the design and production processes of making brooch jewellery, with much attention being paid to the understanding of the cultural, social and technical factors that affect these processes.

Brooches have held a significant place in the history of mankind since ancient times, providing two-fold services of decoration and the utilisation of fastening devices in various civilisations of people and at various times. Brooches were initially useful fasteners and later elaborated into decorative, artistic objects that reflected economic, social and technological transformations. This chapter explores the historical and cultural significance of brooches, how they have evolved in terms of designs, materials, and how they are used nowadays to represent identity and fashion style (Scarbrick, 2007) ^[14]. This study follows the historical journey of the brooch to demonstrate its relevance beyond wearable fashion since it contains both cultural and value of the competent craftsmanship, containing symbolic meaning and individual self-expression.

One of the earliest inventions towards the brooches was to use bone, wood, and stone as rough brooches that were used to fasten clothing in early human civilisations during the prehistoric time. In the Bronze and Iron Ages, particularly in Europe, the proto-brooch and fibula became widely used, having evolved to emerge out of primitive designs (Higgins, 1980) ^[8]. Throughout the periods of history, the fibula passed through the stages of utility to an element of status, which was elaborated by metalworkers using very complicated motifs (Graham-Campbell, 2013) ^[7]. Fibulae were accessories worn by Roman people of both genders, and they had metal brooches bearing military and family emblems (Johns, 1996) ^[9]. The penannular and oval brooches are a Celtic and Viking culture-specific design that was also worn by burying with the dead in order to show the significance of the given item to both the living and the dead (Graham-Campbell, 2013) ^[7].

Both the Middle Ages and the Renaissance saw the progressive sophistication of brooches with gemstones, religious motifs and decorative enamel. Gothic people expressed their religious piety by wearing brooches fitted with Christian signs (Scarbrick, 2007) ^[14]. The Renaissance rekindled classical imagery in the decoration of brooches as people tried to link the Renaissance of humanistic interests and of artistic creativity (Tait, 2008) ^[17]. Brooches became very important fashion accessories during the reign of Queen Victoria, whose mourning jewellery illustrated the fashionable tendencies, containing lockets with hair work and designs made of black enamel (Flower, 2013) ^[6]. With the course of the Industrial Revolution, brooches became more accessible to more individuals, since new production methods enabled middle-income consumers to acquire them (Phillips, 2016) ^[12].

The 20th century gave new lines in the design of brooches with the appearance of artistic movements such as the Art Deco and the Art Nouveau, which provided innovative creative lines. The art form of Art Nouveau presented organic patterns, where the work of Renne Lalique was being applied using glass, horn and flowing curved lines (Fischer, 2005) ^[5]. Over the course of the 20 years between 1920 and 1930, Art Deco designers made use of machine aesthetics and colourful geometric designs to make their brooches (Phillips, 2016) ^[12]. The simple and lower-priced statement items of costume jewellery, which were created by Christian Dior and Coco Chanel, became most notable in their respective collections throughout the post-war years (Johnson, 2020) ^[10]. The modern-day jewellery artist now adopts new methods of brooch making which incorporates abstract forms, mixed

media and also digitally created forms (Untracht, 2007) ^[19]. In the past, the brooches had dual functions, and they provided religious and aesthetic value. Hispanic groups used brooches as religious defence weapons, which exhibited membership of the group (Andrews, 1990) ^[1]. The various cultures have viewed brooches in the form of family inheritances, which in their physical forms have served as a linkage between the current and the history of the past (Scarbrick, 2007) ^[14]. The modern brooch is a device of personal meaning, which is used to communicate oneself and political views and endorsement of social movements (Johnson, 2020) ^[10]. The materials used to manufacture brooches have also changed to incorporate modern materials such as acrylic resin and used materials because of the changing principle of designing jewellery towards sustainability and modernisation (Smith, 2021) ^[16]. The current study aims to deepen our knowledge about brooch jewellery by conducting a historical study that explains the contemporary significance of brooch jewellery. The study records how the brooch has transformed into a utilitarian device to artistic and self-expressive mediums, which retain its cultural importance. Contemporary designers are incorporating the old methods of brooch manufacturing in new forms to create new fashion accessories that can meet the diverse and dynamic fashion environment. The study confirms that brooches are not just old historical items, as they still remain significant, versatile, and personally expressive objects.

During the induction of the Student Representative Council (SRC) in most institutions, they are handed gifts like a medal, cufflinks and a brooch. Nevertheless, students being initiated into the SRC of the Accra University College of Design and Technology (AUCDT) are only being given sashes, whereas other objects ought to be provided to match what other students being initiated in the SRC are getting in other institutions. The researchers consider it significant that there be special jewellery on which the induction of the body of SRC in the institution is represented. This special design of a brooch can be provided to the students who are being inducted into SRC positions in order to be worn during and after the induction ceremony. As an example, the brooches may be carried by the SRC staff on campus. This will make the students of the institution familiar with their SRC officers. This study aims to primarily investigate the design and production of brooch jewellery set with a special interest in comprehending the crucial aspects that drive the processes. Particularly, the research intends to explore the factors of culture and society that affect the design of brooch jewellery, find out the materials and techniques used in the creation of brooch jewellery and design and make brooch jewellery in the SRC of AUCDT.

Theoretical Framework for the Study

The most suitable theory that fits best in the study is Cultural Symbolism and Identity Theory (Pylypiv, 2020) ^[13] to design and fabricate brooch jewellery for the Student Representative Council of AsanSka University College of Design and Technology, Ghana. It has the greatest suitability to the objectives of the research as it focuses on how artefacts such as brooches are used to represent cultural heritage, social status, and personal or group identity. This theory will be helpful in the direct investigation of the cultural and social impact on the design of brooches, incorporation of Ghanaian

patterns (*Gye Nyame* as the symbol of strength), and development of a prototype that would symbolise the values of SRC, since existing induction practices in the University present sashes as the only thing they offer. In contrast to semiotics (symbols) or sustainability (materials), this theory offers a view of the notion of representation of symbols and the strengthening of identities in a holistic way. It considers brooches as a transition between simple fasteners and strong symbols, which can tell a story of power, belonging, and change, and thus it suits the design of an item of meaningful access to improve institutional pride and student identity. The theory will help the study to bridge the gap between the historical traditions and the needs of the modern society, such that the final product is not merely pleasing to the eyes, but its meaning is abundant with references to the Ghanaian identity. The theory affects the choice of motif, i.e., how to blend *Gye Nyame* with some other components, such as diamonds (knowledge), gears (innovation), into a brooch that graphically represents the AUCDT philosophy of growth and progress.

Historical Antecedent of Brooch Jewellery

Brooches have served the purposes of decoration and functionality since ancient times. They developed to match their cultural values, technology and art in other civilisations. Changing between the simple fabric binding devices and the great cultural artefacts, brooches remained topical in terms of all the stylistic and practical changes in history, which started as crude devices created from bones and bronze and evolved into more sophisticated ones in the course of time. Iron brooches that resembled insects were used in the Iron Age by the Celtic cultures, and the penannular brooch contained a ring and pin structure that was never finished but provided convenience in use and reflected on the craftsmanship and the status of the person who wore it (Graham-Campbell, 2013)^[7]. Oval and tortoise shapes, along with Viking brooches, were decorated with precious metals and designs to show social accomplishments. In the ancient period, the Romans and Greeks used fibula fasteners as the main method of fastening their garments. They developed to be more elaborate and ornamental, with gold as opposed to bronze, with jewelled designs (Higgins, 1980)^[8].

The Gothic brooches used between the 12th and 15th centuries bore religious symbols, a phenomenon that signified the strong impact of the Church on medieval society; to portray their better skills in metalworking, artisans used enamelling and setting of gemstones (Scarbrick, 2007)^[14]. Further nurturing the classical art and humanist ideals, the Renaissance led to the inclusion of the portrait miniatures and mythological characters as complex gold work designs on the brooches (Tait, 2008)^[17]. Gender specialisation was also witnessed during this period, with certain styles being associated with masculine and feminine clothing styles, characterising patterns that served as the trends that remained throughout centuries.

The Art Nouveau movement revolutionised the designs in the late 19th century by referring to nature and novel materials to change the production of brooches. René Lalique, a French artist, created remarkable works that have combined both flowing and insect and flower designs and have incorporated unusual materials such as glass and horn to blur the boundaries between the jewellery and sculpture (Fischer, 2005)^[5].

The 20th century brought an overall change to the design of the brooch that changed its application as the accessories. The geometric shapes and bright colours of the 1920s and 1930s, which reflected the modern movement of technologies, were characteristic of the Art Deco period (Phillips, 2016)^[12]. The abstract forms and new materials, including plastics and industrial metals, became popular in post-war times; costume jewellery began to gain popularity with the influence of Coco Chanel, turning brooches into as expensive a treat as they used to be (Johnson, 2020)^[10]. Since their conception, brooches have shown the capability to adjust to the cultural requirements without losing their nature and have been able to incorporate technological features, unconventional objects, and non-traditional components to become expressive pieces of wearable art (Johnson, 2020)^[10]. The development of the fasteners of the Bronze Age to today, as part of the artistic expression, combines the cultural representations with the personal identities. These artefacts maintain their timeless attractiveness because of their combined usefulness with the symbolism, creating the diversity and versatility of the jewellery tradition. Brooches will still have a role in the jewellery practices in future, but will be modified as works of art with specific purposes.

Historical Background of AsanSka University of Design and Technology

AsanSka University College of Design and Technology is a Private University College in Ghana based on the University of education-Winnneba and its accreditation is by the Ghana Tertiary Education Commission (GTEC). It is on the Adenta-Dodowa road opposite the Valley View University (Oyibi, Greater Accra, Ghana).

It was established by Mr Kwabena Asante-Asare, a founder of AsanSka Football Club in the year 2015 and also the Chief Executive Officer of AsanSka Minerals Limited. AsanSka University College of Design Technology (AUCDT)'s vision is to achieve the status of an internationally renowned centre of design education and research. The role of the mission of the AUCDT is to educate professional and non-professional artisans, research and share knowledge and participate in the policy formulation and development of technical and vocational education. AUCDT aims to offer university and professional education by teaching, learning and research and to offer skills that will aid in advancing creative and analytical thinking skills, then again to obtain and distribute knowledge and information and finally to establish a relationship which relates institutions and bodies which share the vision and mission in education (AUCDT, 2025)^[2].

Student Representative Council

The Student Representative Council represents a group of students within the university that holds a strong voice at both institutional and national levels to uphold their interests. The Student Representative Council is a body that represents over one hundred thousand students in the university who voice their interests at both the institutional and national level in a strong manner (Simatou *et al.*, 2020)^[15].

Student Representative Council is the known recognised student governance organisation within higher education that links the students to the administrative entities. The Student Representative Council deals with academic affairs and oversees projects that help students in maintaining their institutional tradition. It consists of student leaders who are

elected into offices (Johnson, 2021) [11]. Various institutions recognise the Student Representative Council, which is established by the university, enabling them to influence the policy decisions, as it provides the student-oriented initiatives (Brown & Davis, 2019) [3]. According to Taylor (2020) [18], the council members use special insignia that demonstrate their positions in leadership and membership of the institution via brooches during ceremonial meetings.

Methods

The qualitative research method was used with a descriptive research method and studio-based research method to study the cultural, social and technical factors of designing a brooch. The approach was selected in order to gain a deep insight into the elements of symbolic representation and identity affirmation in the context of the AUCDT, which correlates with the need to provide a comprehensive evaluation with the help of single or multiple cases according to the general worldview (Creswell, 2014) [4]. The methods were appropriate due to the interest in the comprehensive analysis of the brooch fabrication processes and their incorporation into the SRC induction ceremonies, as the specific institution focused on the study design.

Sampling Technique

Expert purposive sampling was employed in the study since the researchers' targeted respondents who were directly engaged in the SRC activities and decisions related to brooches. The respondents were restricted to major constituents of the SRC, such as the SRC President, the SRC Vice President, the SRC Financial Secretary, the SRC Treasurer, the women commissioner, and other representatives. Moreover, representatives of other committees at the AUCDT (e.g. cultural or design committees) related to jewellery or student affairs were also invited so as to have varied views on the symbolism and usefulness. A sample size of 20 participants was used: 10 of them were sampled under SRC positions and had a minimum of a year as a student leader, and the other 10 were under related committees at AUCDT and had a background in design or in cultural representation. This choice was made to provide specific information on how the brooch may represent institutional values such as resilience (*Gye Nyame*) and innovation.

Data Collection Instruments

Unstructured individual interviews were used to collect qualitative data regarding cultural preferences, symbolic meanings and design feedback. The Sessions discussed the perceptions of respondents regarding whether to introduce Ghanaian motives and fill the gap in SRC insignia or not, and this was an open-ended discussion. The participatory observations were used, and the researchers participated in the studio-based prototyping workshops at AUCDT. This included watching the process of brooch fabrication, e.g. piercing and soldering and watching the interactions during simulated induction ceremonies to determine functionality and symbolism. Design sketches, prototypes, and fabrication phases were photographed in order to record such visual features as motifs (e.g., gears to create innovation) and materials. Participants were given consent, and identities were anonymised as a measure of maintaining confidentiality. The documents of the appropriate AUCDT,

including SRC statutes, records of the past induction, culture guidelines, and other related documents, were examined to put the brooch in terms of induction use.

Data Analysis

The research followed the thematic analysis process, as developed by Creswell (2014) [4], and it included organising and transcribing the interview data, familiarising with words by reading, generating themes (e.g., cultural symbolism, sustainability), coding the responses, and obtaining short quotes. This qualitative study guaranteed that the themes were consistent with the theoretical framework, including identity reinforcement and aesthetic functionality, and confirmed prototype designs. This approach guaranteed the ethical conduct, such as informed consent and anonymity, and presented powerful findings on the development of a culturally resonant, low-cost brooch prototype.

Results and Discussion

This study outlined the findings and discussions from a study focused on various findings obtained by the researchers related to brooch jewellery design and production for the Student Representative Council (SRC) of AUCDT.

Cultural Symbolism and Heritage

The study found that brooches, as wearable artefacts, serve as potent vessels for cultural symbolism and heritage, encapsulating the stories, values, and identities of diverse societies. This theme delves into how these pieces of jewellery draw from specific cultural traditions, embedding motifs that carry deep historical and emotional resonance. By examining brooches through this lens, the study uncovered their role in preserving ethnic legacies while evolving to meet contemporary needs, reflecting a dynamic interplay between tradition and innovation.

An expert in the field of jewellery, J1 at AUCDT, revealed that:

“One prominent example is the Celtic knot, a motif originating from ancient Irish and Scottish cultures. These intricate, interwoven patterns symbolise eternity, continuity, and the interconnectedness of life, often seen in brooches worn during ceremonies or as family heirlooms.”

In Irish folklore, such designs evoke the endless cycles of nature and human existence, making them ideal for brooches that signify enduring bonds, such as those exchanged in weddings or commemorative events. The research found that African tribal emblems further illustrate this theme, with *Adire* patterns from Nigerian Yoruba traditions featuring bold, geometric designs that denote community, strength, and spiritual protection. Brooches incorporating these elements, such as those with abstracted animal or ancestral figures, reinforce ethnic identities and foster a sense of belonging. In Indigenous Australian cultures, dot paintings or Dreamtime symbols on brooches evoke creation stories and land stewardship, bridging ancient lore with modern wearable art. These examples highlight how brooches act as cultural ambassadors, transmitting heritage across generations. An expert in the field of jewellery J2 in AUCDT further expatiated that:

...Yet, cultural symbolism in brooch design is not static. As

societies globalise, these motifs adapt to contemporary contexts. In the context of the AUCDT SRC brooch project, incorporating *Adinkra* patterns preserves local heritage while integrating modern elements like the institution's crest, ensuring relevance for diverse student identities. This adaptation addresses challenges like cultural appropriation, promoting ethical design that honours origins.

The significance of this theme extends beyond aesthetics; brooches become tools for cultural preservation and dialogue. They empower wearers to express pride in their heritage, challenge stereotypes, and foster cross-cultural understanding. However, designers must navigate sensitivities, such as avoiding the commodification of sacred symbols. Ultimately, by weaving cultural motifs into brooch designs, we celebrate diversity and ensure that heritage endures in an ever-changing world, enriching both personal and collective narratives.

Social Status and Identity Markers

The study found that throughout history, brooches have signified social class, wealth, or affiliation, like Victorian-era pieces indicating marital status or aristocratic lineage. This theme examines how designs communicate personal or group identity, including professional roles (e.g., military insignia) or sub-cultural affiliations (Punk or Goth styles), influencing choices in materials and embellishments.

An SRC representative, F1, indicated that:

...Brooches have long functioned as status symbols, with their designs and materials reflecting societal hierarchies. In the Victorian period, elaborate gold brooches adorned with pearls or diamonds signalled aristocratic wealth and marital fidelity, such as mourning brooches worn by widows to denote social propriety. These pieces were not just ornaments but markers of one's position in rigid class structures, where intricate engravings or gemstone settings conveyed prestige

and lineage.

The study found that beyond historical elites, brooches extend to professional identities. Military insignia brooches, often crafted from durable metals like brass or silver with enamel details, denote rank and service, fostering camaraderie and authority. In corporate settings, subtle lapel pins might incorporate company logos, symbolising affiliation and loyalty. Subcultural affiliations add another layer; punk-style brooches feature spikes, chains, or safety pins made from recycled metals, challenging mainstream norms and expressing rebellion. Goth designs, with dark motifs like skulls or crosses in matte black materials, communicate a shared aesthetic of introspection and individuality.

J4 at AUCDT expressed that:

...These choices in materials and embellishments are deliberate: precious metals like gold or platinum elevate status, while affordable alloys or synthetics democratize access. In modern contexts, such as the AUCDT SRC brooch, designs might blend institutional symbols with personal flair, allowing students to assert identities tied to leadership or cultural pride. However, this can perpetuate inequalities if high-end materials exclude certain groups.

Overall, brooches as identity markers highlight social dynamics, enabling self-expression while navigating power structures. Designers must consider inclusivity to avoid reinforcing divides, ensuring these pieces empower diverse voices in an evolving society.

Tools and Equipment

Below is a tabulated overview of tools and equipment used in jewellery making, organised by the specified categories. Each category includes key tools and equipment, along with their primary uses in the context of creating brooch jewellery.

Tool/Equipment	Uses in Jewellery
Crucible	Holds molten metal (e.g., gold, silver) during melting for casting into moulds; ensures even heating and prevents contamination.
Injection Wax Machine	Injects wax into moulds to create precise wax patterns for lost-wax casting, allowing for detailed jewellery prototypes.
Burnout Kiln	Burns out wax from moulds at high temperatures, preparing them for metal pouring in investment casting.
Rubber Moulds	Used for casting resins, waxes, or low-melting metals into shapes like pendants or beads; reusable and flexible for intricate designs.
Centrifugal Casting Machine	Spins moulds to force molten metal into details, ideal for creating rings or small sculptures with uniform density.
Engraving Pen or Burin	Carves designs into metal surfaces (e.g., personalisation on rings or plates); provides fine control for artistic detailing.
Etching Acid (e.g., Hydrochloric and Sulphuric acid)	Chemically etches patterns onto metal by selectively removing material; used for creating textures on jewellery like bracelets or charms.
Scribe or Dividing Tool	Marks precise lines or measurements on metal for engraving guides; essential for symmetry in designs like watch faces.
Rotary Tool with Engraving Bits	Powers attachments for engraving or etching; versatile for adding monograms or patterns to silverware or pendants.
Sandblasting Cabinet	Blasts abrasive media to etch surfaces; creates matte finishes or frosted effects on jewellery pieces.
Jeweller's Saw	Cuts precise shapes or holes in metal sheets; used for creating openings in earrings, brooches, or filigree work.
Drill Press or Hand Drill	Bore holes for settings, rivets, or attachments; crucial for mounting gemstones in rings or pendants.
Punch Set	Creates holes or indentations in metal; often used for eyelets in chains or decorative perforations in cuffs.
Laser Cutter	Precisely pierces intricate patterns in metals or plastics; ideal for modern designs like laser-cut earrings or charms.
Hammer and Anvil	Flattens, shapes or textures metal; used for forging rings, bracelets, or custom wire forms.

Materials

The production of brooch jewellery for the Student Representative Council (SRC) of AUCDT emphasises affordability, durability, cultural relevance, and sustainability, given the institutional context in Ghana. Common materials are selected for their accessibility, cost-effectiveness, and alignment with local resources, while techniques focus on traditional craftsmanship blended with modern methods to ensure scalability

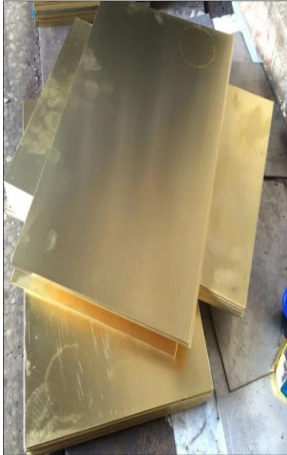


Fig 1: Brass Sheet



Fig 2: Copper Sheet



Fig 3: Smelted silver

Techniques

Casting and Moulding

Casting and moulding are fundamental techniques in brooch production, particularly for creating the base forms that define the jewellery's structure and aesthetic. Wax or sand casting stands out as a prevalent method, enabling the fabrication of intricate designs such as circular motifs inspired by cultural symbols or institutional crests. In wax casting, also known as lost-wax casting, a wax model of the brooch is crafted, coated in a refractory material, and heated to melt away the wax, leaving a mould into which molten metal is poured. This process allows for high precision, capturing fine details like engravings or patterns without compromising the design's integrity.

Sand casting, on the other hand, involves packing sand around a pattern to form a mould, which is then filled with metal. It's cost-effective and suitable for larger batches, making it ideal for producing multiple brooches for SRC members. Both techniques are readily accessible through local foundries in Ghana, such as those in Accra or Kumasi, where skilled artisans use affordable materials like brass or copper sourced from scrap yards. This accessibility supports sustainable practices by minimising imports and fostering local economies.

For the AUCDT SRC brooch, wax casting was employed to shape a circular base incorporating interwoven patterns, ensuring durability and a polished finish. The technique's versatility allows for customisation, such as adding clasps or embellishments post-casting. However, challenges like mould imperfections can be mitigated with prototyping. Overall, casting and moulding empower efficient, scalable production, aligning with the project's goals of cultural relevance and affordability.

for student events or branding.

Metals

Brass and copper are widely used due to their low cost and malleability (Figures 1 to 3). Silver or gold-plated alternatives provide a premium look without high expense. Recycled metals, sourced from scrap or local artisans, promote environmental sustainability and reduce costs, aligning with AUCDT's values.

Engraving and Etching

Engraving and etching are essential techniques for personalising brooch jewellery, adding depth, detail, and meaning to the design. Laser or hand engraving allows for the incorporation of acronyms, symbols, or intricate patterns, such as the AUCDT SRC crest, ensuring each piece reflects individual or group identity. These methods enhance durability and precision, making brooches not just functional accessories but meaningful artefacts.

Laser engraving uses high-powered lasers to vaporise material from the brooch's surface, creating clean, precise lines. It's ideal for metals like brass or silver, producing fine details without physical contact, which minimises wear on tools. Hand engraving, performed with chisels or rotary tools, offers artisanal control, allowing skilled artisans to etch freehand designs that convey cultural motifs, like interwoven patterns symbolising unity. CNC (Computer Numerical Control) machines automate the process for consistency in batch production, while acid etching involves applying corrosive substances (e.g., hydrochloric and sulphuric acid) to chemically remove material, resulting in etched grooves that can be filled with enamel for contrast.

For the AUCDT SRC brooch, laser engraving was used to personalise the circular base with the acronym and symbolic elements, ensuring a professional finish resistant to fading. These techniques are accessible in Ghanaian workshops, where local artisans blend traditional hand methods with modern CNC technology, keeping costs low. However, precision requires skilled operators to avoid errors like uneven depths. Overall, engraving and etching elevate brooches from simple items to personalised statements, aligning with the project's emphasis on cultural relevance and scalability.

Soldering and assembly are critical techniques in brooch production, focusing on joining components to create a cohesive, durable piece. Pieces are joined using solder, typically tin-lead alloys, which melt at lower temperatures than the base metal, forming strong bonds without distorting the design. Adhesives, such as epoxy resins or cyanoacrylates, complement soldering by securing non-metallic elements like gemstones or clasps, ensuring overall structural integrity and preventing disassembly under wear.

The soldering process involves heating the joint with a torch or soldering iron, applying flux to clean surfaces, and introducing the solder, which flows into the gap for a seamless connection. This method is precise and cost-effective, ideal for intricate brooch designs where components like the pin back or embellishments must align perfectly. Electroplating, which is a common process, follows assembly, adding a metallic finish such as gold or silver plating to enhance shine, corrosion resistance, and aesthetic appeal. The process immerses the brooch in an electrolytic solution, depositing a thin layer of metal that protects against tarnish and gives a professional lustre.

For the AUCDT SRC brooch, soldering assembled the silver base with engraved elements and a clasp, while electroplating provided a durable, shiny finish suitable for formal wear. These techniques are. However, proper ventilation is needed to avoid lead exposure from tin-lead solder. Overall, soldering and assembly ensure that brooches are robust and visually appealing, supporting the project's goals of functionality and cultural personalisation.

Emerging Techniques

3D printing for prototyping allows quick iterations, enabling designers to test and refine brooch designs rapidly before final production. This additive manufacturing process builds layers of material (e.g., resin or plastic) based on digital models, facilitating complex shapes like circular motifs or cultural symbols without traditional moulds. Hand-polishing or buffing refines surfaces, using abrasives or rotary tools to achieve a smooth, shiny finish that enhances durability and aesthetics.

3D printing is particularly valuable for prototyping, as it supports iterative design changes, e.g., adjusting sizes or adding engravings, reducing material waste and time compared to casting. Once prototyped, hand-polishing removes imperfections, blending modern tech with artisanal skills for a professional result. These methods balance tradition with innovation, preserving cultural craftsmanship while incorporating digital tools, making them ideal for AUCDT's educational workshops where students can learn both techniques.

For the AUCDT SRC brooch, 3D printing prototyped the base form, followed by buffing for a polished brass-like finish. This is accessible in Ghanaian tech hubs or universities to promote sustainability.

Idea Development for the Brooch

The brooch featuring the AUCDT logo represents a fusion of cultural, intellectual, and technological symbolism, designed as a wearable emblem for the AUCDT. It integrates four key elements: *Gye Nyame* symbol, diamond book, leaf, and gear into a cohesive design that embodies resilience, knowledge, growth, and innovation.

The idea evolved from a need to create a distinctive, meaningful accessory that reflects AUCDT's mission.

Symbolism of Elements

Each component carries layered meanings, blending African traditions with universal themes:

Gye Nyame Symbol: An *Adinkra* emblem from Ghanaian culture, depicting a crossed sword and staff, symbolising "except God" or divine supremacy. It represents spiritual strength, protection, and the unyielding power of faith, anchoring the brooch in African roots and emphasising AUCDT's role in fostering continental unity under higher ideals.

Diamond and Book: A stylised book shaped like a diamond, evoking clarity, value, and intellectual wealth. Diamonds symbolise durability and brilliance, while the book motif highlights education, policy, and knowledge dissemination; a core value to AUCDT's work in governance, research, and capacity-building across Africa.

Leaf: A simple, organic leaf form, signifying growth, renewal, and environmental sustainability. It nods to Africa's natural bounty and the need for ecological balance, aligning with AUCDT's initiatives in sustainable development and climate resilience.

Gear: A mechanical gear, representing industry, progress, and interconnected systems. It underscores technological advancement and collaboration, reflecting AUCDT's efforts in innovation, infrastructure, and economic integration for Africa's future.

Together, these elements form a logo that visually narrates a journey from spiritual foundation to intellectual and technological empowerment, with the leaf adding a touch of natural harmony.

Design Development Process

The brooch's idea developed iteratively, starting from conceptual sketches to a refined, wearable artefact:

Initial Inspiration

The concept began with AUCDT's mandate to promote unity and development in Ghana. The researchers drew from *Adinkra* symbols for cultural authenticity, combining them with modern icons to create a logo that feels timeless yet forward-looking. Early drafts explored how to interlock the elements without overcrowding, ensuring the *Gye Nyame* as a central, protective frame.

Element Integration

The logo was structured with the *Gye Nyame* at the core, overlaid or surrounded by the diamond book (positioned like a cornerstone), a leaf sprouting from the sides (symbolising growth), and a gear interlocking at the other right side (for mechanical synergy). This arrangement creates a balanced, symmetrical composition, adaptable to a brooch form, perhaps a circular or shield-shaped pin.

Material and Aesthetic Choices

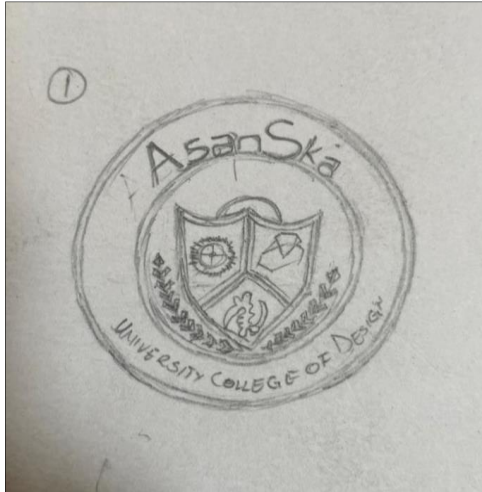
To enhance symbolism, the brooch was crafted from materials such as silver for durability, with designs of accents

for the leaf and gear. The *Gye Nyame* was pierced, while the diamond book features subtle piercing and engraving. Size-wise, it was 2-3 inches for lapel wear, ensuring it's lightweight yet substantial.

Idea Evolution and Impact

From a basic logo sketch to a symbolic brooch, the development emphasised storytelling: the *Gye Nyame* provides spiritual grounding, the diamond book imparts

wisdom, the leaf fosters hope, and the gear drives action. This evolution mirrors AUCDT's own progression toward integrated African solutions. The brooch could serve as a diplomatic gift, a staff badge, or a collectable, fostering pride and conversation about Africa's potential. Future iterations might incorporate personalisation, like engraved names, or eco-friendly materials to amplify the leaf's message. Overall, it transforms abstract ideas into a tangible emblem of unity and aspiration (Figures 4 to 7).



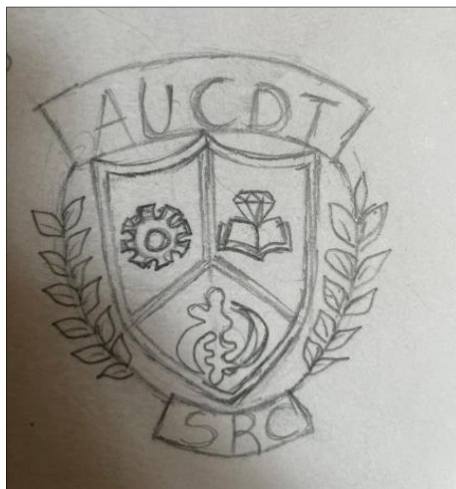
Source: Studiowork by Researchers, 2025

Fig 4: Idea Development 1



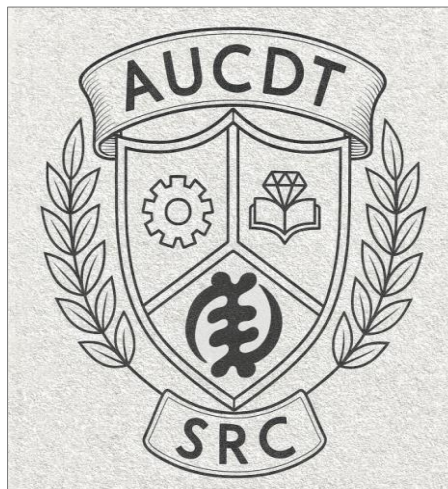
Source: Studiowork by Researchers, 2025

Fig 5: Idea Development 2



Source: Studiowork by Researchers, 2025

Fig 6: Idea Development 3



Source: Studiowork by Researchers, 2025

Fig 7: Final Design

Fabrication Process

The fabrication of the AUCDT brooch, featuring the logo with the *Gye Nyame* symbol, diamond book, leaf, and gear, follows a meticulous jewellery-making process. This involves transforming raw materials into a durable, symbolic wearable piece. The process started with piercing the base metal and progresses through shaping, assembly, and finishing. The study outlines the key stages, drawing from traditional and modern metalworking techniques used in custom jewellery production. This ensures the brooch's elements: spiritual (*Gye Nyame*), intellectual (diamond and book), natural (leaf), and mechanical (gear) are crafted with precision, using materials like silver for durability.

Preparation and Piercing

Fabrication begins with selecting and preparing the base material. For the AUCDT brooch, silver is chosen for its malleability, affordability, and symbolic lustre, evoking the diamond book's brilliance. A sheet of silver (about 1-2mm thick) is cut to the brooch's outline, often a circular or shield shape measuring 2-3 inches in diameter, using a jeweller's saw or laser cutter for accuracy. Piercing is the initial shaping step, where the base metal is perforated to create openings for the logo elements. Using a piercing saw (a fine-toothed tool), the researchers outline and remove excess metal to form the core structure (Figures 8 and 9).

The *Gye Nyame* symbol is pierced as a central, raised motif, with negative space around it for depth. The diamond and

book are pierced as a faceted shape, with slots for layering. The leaf is chased, and repousse is done for the delicate veins, and the gear is pierced with interlocking teeth (Figures 10 and 11). This step requires precision to avoid weakening the

metal; templates or CAD software ensure symmetry. Piercing takes 1-2 hours per piece, depending on complexity, and any burrs are smoothed with files to prevent snags.



Source: Studiowork by Researchers, 2025

Fig 8: Piercing of Designs 1



Fig 9: Piercing of letterings

Shaping and Forming

Once pierced, the metal is shaped to add dimension. The base plate is bent or hammered on a mandrel (a cylindrical tool) to create a slight curve for lapel attachment. For the gear element, a separate silver disc is cut and pierced with gear teeth, then shaped into a rotatable component using a rolling mill or press.

At this stage, soldering joins components: a torch melts silver solder to attach the gear to the base and the leaf to the *Gye Nyame*. Flux is applied to prevent oxidation, and annealing (heating and cooling) softens the metal for easier manipulation. This shaping phase lasts 2-4 hours, ensuring the brooch feels balanced and lightweight (under 20 grams).



Source: Studiowork by Researchers, 2025

Fig 10: Chasing and repousse of crest



Fig 11: Chasing and repousse of leaf

4.2.3.2. Assembly and Finishing

Assembly integrates the symbolic elements into a cohesive design. The pierced base serves as the canvas, with the *Gye Nyame* soldered centrally. The diamond book is affixed atop it. The leaf is positioned, sprouting from one side, and the gear is mounted at the sides, allowing slight rotation to symbolise movement. A brooch pin mechanism is attached,

typically a safety clasp soldered to the back for secure wear. This detailing step involves hand-finishing with abrasives to blend seams, ensuring no sharp edges. Finishing polishes the brooch to a high shine, enhancing its symbolic appeal. The piece was polished with emery and soap to remove scratches, followed by buffing with rouge compound on a wheel for a mirror-like finish.



Source: Studiowork by Researchers, 2025

Fig 12: Using the tripoli to remove scratches **Fig 13:** Buffing for a glossy finish



Source: Studiowork by Researchers, 2025

Fig 14: Finished Brooch Jewellery

General Discussion

The results of this research indicate that brooch jewellery is an effective tool for expressing culture and reinforcing identity in the context of the Student Representative Council (SRC) of the Australian Universities College of Design. The prototype brooch is a representation of institutional values, as the elements of Ghanaian culture, i.e. Gye Nyame symbol, which symbolises resilience and divine supremacy, are mixed with contemporary features, i.e. a diamond-shaped book (knowledge), a leaf (growth), and a gear (innovation). This can be explained by the Cultural Symbolism and Identity Theory (Pylypiv, 2020)^[13], according to which artefacts such as brooches serve as transitional objects between the past and the present and help the wearers to convey the group belongingness and their personal stories. The qualitative data on the interviews and observations highlighted the role such designs play in filling the gap in the SRC induction ceremonies, where sashes do not convey leadership and heritage on their own, thereby increasing the meaning of the ceremony and involvement of students in the ceremony.

On the technical level, efficient utilisation of sustainable material (e.g., recycled brass and silver) and available methods (piercing, soldering, engraving, and 3D printing)

proves that the brooch can be affordable due to its cost-efficiency and robustness because of its durability. Such a method is not only less harmful to the environment, but it is also a step towards supporting the local handicraft, which benefits the wider area of jewellery design by providing an example of culturally attuned, low-cost accessories. The functionality of the prototype, lightweight, polished, and clasp, makes it a practical choice in terms of formal wear, whereas the symbolic depth of the prototype provokes a conversation about the African heritage and the innovativeness.

The small sample size ($n=20$) used, however, can be a limitation to generalization and the study relied on local resources, which can be limiting to scalability. Such ethical concerns as the need to avoid cultural appropriation in the choice of motifs were worked out in terms of consultations with experts. The next step in the research can be digital personalisation (e.g., engraving names) and longitudinal research on wearability to improve the designs. All in all, this research contributes to the knowledge of brooches as a marker of identity, which the AUCDT may use as a device of institutional branding and motivates similar efforts to enhance community ties in educational institutions.

Conclusion and Recommendation

To summarise, this paper was able to develop and produce a symbolic brooch jewellery item for the SRC of AUCDT, Ghana, and it fills an essential vacuum in the induction rituals because it proposes a wearable item that embodies cultural heritage, institutional values, and student identity. This is symbolically represented by the brooch, which incorporates the use of *Gye Nyame*, which is a symbol of resilience, a diamond book, which is a symbol of knowledge, a leaf, which is a symbol of growth and a gear, which is a symbol of innovation which represents the mission of the school to enhance unity, education and progress in Africa. The prototype, made of sustainable materials such as silver and brass, by methods such as piercing, soldering, and engraving, is not only cost-effective and therefore accessible to most students, but also durable and culturally-relevant, which raises the visibility and pride of SRC among students.

The study adds to the jewellery design by demonstrating how jewels may strengthen social identities and uphold traditions, and at the same time be in synchrony with contemporary sustainability objectives. It gives the AUCDT the capacity to create a sense of belonging and leadership using symbolic accessories, which may affect the same in other institutions. Nonetheless, material sourcing and scalability are issues that point to potential problems in research on digital fabrication and stakeholder involvement. Future research can build on personalisation and long-term wearability testing to improve the design to make sure that it remains a useful instrument of cultural and educational expression.

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How to Cite This Article

Owusu Addo AR, Ofori SKD, Asomaning K, Akpor C, Panin KBO. Design and fabrication of brooch jewellery for the Student Representative Council of Asanska University College of Design and Technology, Ghana. International Journal of Humanities and Sustainable Innovation. 2026 Mar-Apr;2(2):1-11.

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