

**IFFTI Funded Study Visit Report: Digital Integration in Fashion Education at  
Bunka Gakuen University (November 2025)**  
by  
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## **Purpose and Objectives**

The primary purpose of the visit to Bunka Gakuen University was to gain a comprehensive understanding of how digital technology is embedded across their fashion curriculum from initial research and concept development through to prototyping and final presentation outcomes. This investigation evaluates how digital methodologies are integrated alongside traditional craftsmanship within both undergraduate and postgraduate programmes.

## **Curriculum Integration of Digital Technology**

The visit examined:

- How digital tools are introduced at early stages of research and concept building
- The relationship between physical experimentation and digital prototyping
- The progression from 3D simulation to final garment realisation
- The extent to which digital workflows replace or supplement traditional processes

Particular attention was paid to whether digital systems are embedded as core methodologies rather than peripheral technical modules.

## **Research Infrastructure and Learning Resources**

A key objective is to assess the depth and breadth of research materials available to students, including:

- Physical libraries and specialist publications
- Archival garment collections
- Catwalk documentation and show recordings
- Fabric libraries and yarn banks
- Digital asset repositories
- 3D prototyping facilities

The visit also identified the pattern cutting methodologies taught, including:

- Flat pattern cutting
- Draping on the stand
- Digital pattern development software

Additionally, final presentation formats were evaluated, including:

- Static exhibition
- Physical catwalk
- Virtual catwalk or digital showcase

## **Documentation and Design Process**

The visit included observation of how students document and develop their work through:

- Physical sketchbooks
- Digital sketchbooks and process portfolios
- Integrated design software workflows

Specific software platforms to be reviewed include:

- CLO
- Browzwear
- SDS-ONE APEX4 (for knitwear development)

The aim is to understand how these systems support:

- 3D garment simulation
- Virtual sampling
- Fit evaluation
- Digital rendering and presentation

## **Focus Study: Shima Seiki APEX Integration**

A central focus of the visit was the delivery of Shima Seiki APEX Design Software within knitwear education.

Areas of investigation include:

- How virtual sampling is taught
- Use of 3D avatars within knitwear simulation
- Translation from APEX digital files to physical sampling
- Direct linkage between design software and Shima knitting machinery
- Workflow efficiency from concept to production

This is especially relevant given that Manchester Fashion Institute has recently acquired a Shima Seiki digital knitting machine and is currently implementing APEX design software for students specialising in knitwear. Understanding Bunka's pedagogical model will directly inform curriculum development and digital integration strategies at Manchester Fashion Institute.

## **Institutional Overview**

Bunka Gakuen University is a university-level institution offering accredited academic degrees, including master's-level qualifications. The university houses the Graduate School of Fashion and Living Environment Studies, which includes advanced programmes such as the Global Fashion Concentration (MA), positioning the institution within both creative and research-led higher education frameworks. The university demonstrates a vertically integrated model of fashion education spanning undergraduate, postgraduate, and specialist technical training.

### **Bunka Fashion College**

Bunka Fashion College, operating within the Bunka Gakuen educational structure, has emerged as one of Japan's leading institutions in the advancement of:

- Virtual fashion
- 3D garment modelling
- Digital garment simulation
- Hybrid physical–digital design education

Since 2024, the college has launched significant new initiatives, including a dedicated Virtual Fashion Course focused on 3D modelling, digital content creation, and industry-aligned digital transformation (DX) practices.

These developments position Bunka at the forefront of digital fashion pedagogy in Japan, integrating creative studio practice with advanced technological systems and industry partnerships.

**21<sup>st</sup> November 2025 visit to Knit Design CADII – Shima Seiki Class Visit, Faculty of Fashion Science/Department of Fashion Creation (Laboratory of Production Engineering, Prof. Noriyuki Wakatsuki)**

### **Overview of Teaching Model**

The Knit Design CADII module is delivered over a 6-month period, consisting of 14 classes for a cohort of 15 students.

The teaching studio is equipped with:

- 15 computers, each installed with SDS-ONE APEX4
- Access to three Shima Seiki mini knitting machines
- Two WHOLEGARMENT® knitting machines
- Academic and technical staff support for machine operation and troubleshooting

Software Used: SDS-ONE APEX4SDS developed by Shima Seiki is a comprehensive hardware-and-software integrated design system used for:

- Planning and design development
- Colourway creation and textile simulation
- 3D virtual sampling
- Pattern CAD
- Knitting machine programming
- 3D garment visualisation

### **Sustainability & Efficiency Benefits**

The system enables:

- Reduction of physical sampling waste
- Faster product development cycles
- Realistic knit and textile visualisation before production
- Virtual prototyping prior to machine knitting

### **Software Skills Covered in the Program**

Students are trained in:

- Avatar creation
- Basic 3D garment creation
- Stripe, jacquard, and knit structure development

- Flat-knit simulation
- 3D simulation with accessories
- Virtual prototyping
- Digital garment visualisation
- Multi-software pipelines (including integration with tools such as CLO, Blender, and Browzwear)

Each student has direct access to a workstation, so the cohort can be taught together, allowing:

- Faster progression through the software
- Broader curriculum coverage within 6 months
- Greater independent exploration and experimentation

### **Machine Access and Student Autonomy**

Students at Bunka operate the knitting machines themselves, rather than relying solely on technicians.

Machine access includes:

- 3 mini machines
- 2 WHOLEGARMENT® machines
- Multiple gauges

This model:

- Accelerates sampling turnaround
- Enables rapid garment iteration
- Supports advanced fabric and seamless garment production
- Develops strong technical independence

There are no hand flat machines in this studio. Students have previously completed classes in jersey construction before beginning Shima Seiki instruction

### **Comparison with BA Fashion at MFI, Manchester Metropolitan University (MMU)**

At MFI the :

- Program runs over **3 years**
- Digital element delivered primarily in the **final year**
- Similar student cohort size

### **Structure at MFI**

#### **Year 1**

- Induction to domestic knitting machines

#### **Year 2**

- Induction into Dubied hand flat machines
- Garment construction

#### **Year 3**

- Introduction to: APEXFiz,

- Introduction to: SDS-ONE APEX4
- Teaching is delivered in smaller groups
- There are 2 APEX4 machines, 4 APEXFiz licences
- Students develop fabrics digitally
- Files are passed to a technician
- Samples and body panels are run on a single 12-gauge Shima Seiki machine
- Students do not operate the industrial knitting machine themselves

### **Key Structural Differences**

<b>Bunka Gakuen University</b>	<b>MFI</b>
6-month intensive delivery	3-year staged delivery
15 computers with APEX4	Limited APEX4 machines & licences
Students operate machines	Technician-led machine operation
5 Shima Seiki machines	1 industrial machine
2 WHOLEGARMENT® machines	No full garment machines
Faster sampling & iteration	Slower production turnaround
Integrated 3D + machine workflow	Digital introduced at final stage

### **Observed Impact**

Bunka students:

- Have more software access
- Work in larger simultaneous cohorts
- Operate machines directly
- Have multiple gauges available

They are able to:

- Cover all aspects of the APEX system in a shorter timeframe
- Develop higher technical confidence
- Prototype and iterate more quickly
- Produce more advanced knit structures and full garments

The integration of hardware, software, and machine autonomy creates a highly industry-aligned workflow.

### **Conclusion**

The Bunka Gakuen University model represents an intensive, industry-aligned approach to knitwear digital education. The integration of SDS-ONE APEX4, direct machine operation, and multi-software pipelines enables students to cover a comprehensive range of digital and production skills within a condensed timeframe.

The MFI model provides a longer developmental structure with staged technical progression but comparatively limited direct industrial machine access and reduced digital integration in earlier years.

**25<sup>th</sup> November visit to The Faculty of Fashion Science – Department of Fashion Creation, Bunka Gakuen University**

## **Course Overview**

This section outlines observations from the Department of Fashion Creation within the Faculty of Fashion Science at Bunka Gakuen University, under the direction of Prof. Sayaka Kamakura.

The course is structured to train students in:

- Creative design development
- Conceptual research and exploration
- Garment creation and construction
- Textile experimentation
- Digital design integration

The pedagogical emphasis is placed on:

- Aesthetic research
- Creative methodologies
- Design thinking processes
- Concept-driven garment development
- Exploration-led practice

The programme promotes the integration of both physical and digital processes within a studio-based learning environment.

## **Observed Teaching Session**

During the observed session, students were presenting design concepts derived from primary research. Research outputs were developed through both:

- Digital exploration
- Physical experimentation

Students demonstrated concept articulation through:

- Visual research boards
- Material sampling
- Prototype development
- Garment experimentation

The teaching model aligns closely with the delivery of the BA Fashion programme at Manchester Metropolitan University, particularly in its:

- Studio-based format
- Emphasis on originality
- Flat pattern cutting and draping
- Focus on developing complete outfits
- Integration of research into tangible design outcomes.
- Catwalk outcomes

Both institutions prioritise conceptual rigour, practical garment construction, and the cultivation of an individual design voice.

**25<sup>th</sup> November 2025 Visit to the Library and Resource Centre**

A significant strength of Bunka Gakuen University lies in the depth and accessibility of its research infrastructure. Student access to resources is comprehensive and internationally recognised.

### **Library**

- Holds approximately **340,000 volumes**
- Is internationally recognised as a specialised fashion and clothing library

Collection areas include:

- Fashion design
- Clothing science
- Textile technology
- Costume history

This concentration of subject-specific material supports both theoretical inquiry and practical application.

### **Fashion Magazine Archive (Domestic and International)**

The archive contains approximately:

- 3,000 magazine titles, including long-term back issues

Coverage includes:

- Japanese fashion publications
- International fashion publications

This archive enables longitudinal research into:

- Trend evolution
- Editorial styling
- Visual culture shifts
- Global fashion narratives

### **Digital Archive of Rare Fashion Materials**

Bunka maintains a substantial digital archive consisting of:

- Fashion plates
- Accessories documentation
- Art Deco illustrated books
- Historic magazines
- Japanese historical clothing texts
- 

Archive scale:

- 418 titles
- Approximately 94,000 digitised images

This digital access allows students to engage directly with rare and historic primary materials in a research-led design process.

### **Bunka Fashion Resource Centre**

Closely integrated with the main library, the Bunka Fashion Resource Centre includes:

- 8,000 systematically organised textile samples

- Fashion show video archives (including Paris Collections)
- A costume archive spanning over 90 years of garment collection

This integrated structure provides a cross-referenced research environment combining:

- Textile materiality
- Historical garment study
- Contemporary runway analysis

### **Bunka Gakuen Costume Museum**

The Bunka Gakuen Costume Museum houses:

- Over 20,000 historical garments from around the world

The museum functions as:

- A research facility
- An exhibition space
- A primary source archive for student study

Students have access to fashion garments, enabling direct object-based research that informs both concept and construction.

### **Databases and Online Access**

Students are provided access to:

- Online fashion journals
- Academic research databases
- OPAC search system for books and archival materials

This ensures that both contemporary and historical research materials are accessible through digital systems.

### **Film and Moving Image Archive**

The Fashion Resource Center holds over 2,400 fashion-related films, including:

- Fashion collection videos (1985–present)
- Academy Award–winning costume design films
- Student fashion show documentation
- SO-EN Award contest footage
- Textile and material instructional films

This moving-image archive strengthens:

- Historical analysis
- Runway literacy
- Understanding of garment movement and performance
- Contextual awareness of global fashion systems

### **Research Impact on Design Development**

The breadth and depth of research access at Bunka Gakuen University significantly enhance the conceptual development of student work. The availability of:

- Rare archival materials

- Textile samples
- Historic garments
- Film archives
- Global fashion publications

This supports a highly research-informed design culture.

The integration of primary historical research, material investigation, and digital design methodologies fosters:

- Conceptually grounded creative practice
- Historically aware design development
- Experimentation supported by extensive visual and material reference

### **Concluding Observations**

The Department of Fashion Creation at Bunka Gakuen University demonstrates:

- A strong conceptual design framework
- Integration of digital and physical methodologies
- A robust research ecosystem supporting creative inquiry

The studio-based delivery closely aligns with the BA Fashion approach at Manchester Metropolitan University in terms of creative emphasis; however, the scale and specialisation of Bunka's archival and material resources provide an exceptional research infrastructure that directly informs student innovation and design exploration.

**26<sup>th</sup> November 2025 International Fashion – Second Year Special Lecture and Workshop, International Fashion Programme, Faculty of Intercultural Studies**  
(Department of International Fashion and Culture Studies, Prof. Kaori Sugisawa)

### **Programme Overview**

The International Fashion Course provides students with a theoretical understanding of fashion in a global context

- The curriculum combines:
  - Garment creation
  - Flat pattern cutting and draping
  - Garment construction
  - Textile handling
  - Styling and performance
  - Intercultural communication

A distinctive element of the programme is the simultaneous development of English language proficiency through specialist modules that integrate fashion education with language learning. This dual-focus structure supports students in engaging with global fashion discourse and international professional environments.

In the second year, students advance toward more technically and conceptually complex work. The curriculum includes:

- Exploration of new and experimental materials
- Three-dimensional cutting techniques
- Advanced garment construction
- Higher-level design development
- Deeper contextual and cultural analysis

The programme positions fashion not only as a material practice but as a cultural and communicative system, encouraging students to connect creative production with global perspectives.

### **Professional and International Engagement**

The course prepares students for international careers through:

- Fashion show production
- Stage and media performance projects
- Overseas study opportunities
- International presentations and exhibitions

Over the past two years, students have presented a catwalk show in Manchester at the Manchester Fashion Institute, part of Manchester Metropolitan University. This international showcase demonstrates a strong institutional relationship and reinforces the global orientation of the programme.

### **Special Lecture and Workshop Delivery**

During the visit, I delivered a special lecture and workshop session to second-year International Fashion students.

#### **Lecture Component**

The lecture addressed:

- The full design process from initial concept to final runway line-up
- Translation of research into cohesive collection development
- Structuring garments within a professional catwalk context
- Industry expectations within the UK fashion system

The session contextualised design development within an international framework, aligning conceptual thinking with presentation strategy.

#### **Workshop Component**

The subsequent workshop focused on:

- Innovative silhouette exploration
- Experimental garment development
- Structural manipulation and spatial form
- Expanding three-dimensional design thinking

Students engaged enthusiastically with the session and demonstrated strong creative outputs. The workshop format encouraged rapid idea generation, experimentation, and collaborative exchange.

## **Pedagogical Observations**

The International Fashion programme reflects several key pedagogical strengths:

- Integration of language and fashion education
- Emphasis on intercultural awareness
- Strong connection between performance and garment
- Preparation for international mobility
- Confidence in public presentation contexts

The combination of creative practice, communication training, and global exposure supports the development of designers capable of operating across cultural and professional boundaries.

**27<sup>th</sup> November, BFGU Creation Course – First Year MA Special Lecture and Workshop, Bunka Fashion Graduate University (BFGU). Division of Fashion Creation / Fashion Design Course (Prof. Kimino Homma)**

## **Programme Overview**

The Fashion Creation Course (First Year) at Bunka Fashion Graduate University forms part of a two-year MA programme designed to provide an intensive, graduate-level foundation in advanced fashion design and professional creative practice.

The curriculum integrates:

- Conceptual research and design development
- Advanced garment construction
- Patternmaking
- Textile experimentation
- Industry-standard digital design tools
- Professional studio methodologies

Students are supported through a structured studio environment that combines theoretical inquiry with technical application, preparing them for the advanced specialisation and independent project work undertaken in the second year of the MA.

## **Pedagogical Framework**

First-year studies emphasise mastery of core design methodologies, structured around:

- Research and concept generation
- Critical analysis and idea refinement
- Experimental form-making
- Silhouette exploration
- Technical problem solving

- Iterative design development

The integration of design and technology encourages a practice-led research approach aligned with contemporary global fashion innovation. The curriculum is deliberately industry-oriented, cultivating graduates capable of contributing to international fashion.

### **Technical Infrastructure**

Students benefit from advanced studio resources, including:

- Access to laser cutting machines within the studio
- Digital design tools
- Specialist technical guidance

The presence of laser-cutting technology enables:

- Precision pattern experimentation
- Textile surface development
- Structural garment manipulation
- Hybrid material exploration

This access supports a high level of experimentation and technical refinement within the graduate studio environment.

### **Special Lecture and Workshop**

During the visit I delivered a special lecture and workshop session to first-year MA students.

#### **Lecture Focus**

The lecture addressed:

- Conceptual development from research to resolved garment
- Refinement of silhouette and structural identity
- Cohesion within collection development
- Positioning work within international fashion contexts

The session reinforced the importance of conceptual clarity alongside technical excellence at postgraduate level.

#### **Workshop Outcomes**

During the workshop:

- Students presented well-researched and developed concepts
- Projects demonstrated clear critical engagement with source material
- Communication of ideas was conducted confidently in English
- Design proposals were articulated with professional clarity

The student work presented by staff, including completed outfits from the programme, was produced to a high technical standard. Garments demonstrated:

- Innovative cut

- Advanced textile manipulation
- Structural experimentation
- Strong conceptual coherence

The overall standard reflected the expectations of a post-graduate level fashion design programme with international ambition.

**27<sup>th</sup> November 2025 BFC – Apparel Design Course (2nd Year) CLO 3D Class  
Bunka Fashion College (BFC), Fashion Technology Department / Apparel  
Design Technique (Mr. Satoshi Tokuoka)**

**Course Overview**

The second-year Apparel Design CLO 3D class introduces students to industry-standard 3D garment simulation used in contemporary fashion development. The course sits within the Fashion Technology Department and supports the integration of digital methodologies into core apparel design training.

Students are introduced to CLO, a widely adopted digital platform for garment simulation and virtual prototyping. The three-hour session can be delivered to a maximum of 50 students. Each workstation is equipped with dual screens, enabling students to view the workflow presentation on one screen while working through the exercises on the second screen. Class progress is checked by the professor remotely to monitor progress.

CLO 3D is not linked to Lectra or Gerber systems, but it does integrate with Pattern Magic, allowing pattern concepts developed in Pattern Magic to be transferred into the CLO environment. Pattern Magic is widely used at Bunka as a creative pattern-making method that can be translated into digital pattern cutting workflows. Although Pattern Magic originated as a *manual*, sculptural pattern system, Bunka incorporates it into modern digital tools such as CLO 3D, Adobe Illustrator, and apparel CAD.

**Learning Objectives**

The course aims to develop student competency in:

- Digital pattern creation
- Construction of virtual garments
- Silhouette and proportion evaluation
- Digital fit assessment
- Professional digital workflow integration

Through structured exercises, students connect existing 2D patternmaking knowledge with 3D garment simulation, strengthening their understanding of spatial construction and form development.

**Digital Workflow Development**

The curriculum emphasises full digital workflow competency, including:

- Fabric behaviour simulation

- Avatar adjustment and body measurement modification
- Digital sewing and assembly
- Real-time simulation analysis
- Rendering for presentation
- Technical file output for production workflows

Students develop the capacity to move fluidly between 2D pattern logic and 3D garment visualisation, accelerating design iteration and evaluation.

### **Sustainability and Industry Alignment**

A key pedagogical objective is enabling students to assess garments digitally prior to physical prototyping. This approach supports:

- Reduced material waste
- More sustainable sampling processes
- Faster design iteration
- Improved decision-making before production

The integration of CLO aligns the programme with current industry expectations, where digital sampling and virtual presentation are increasingly standard within global fashion development.

### **27<sup>th</sup> November 2025 Exhibition of Work – Virtual Fashion Course Bunka Fashion College Virtual Fashion Course (Launched 2024) Apparel Technology Department**

In 2024, Bunka Fashion College launched a dedicated Virtual Fashion Course for third-year students within the Apparel Technology Department. The course is designed to train advanced 3D fashion modelers capable of operating at the forefront of digital fashion development. The exhibition of student work demonstrated a strong integration of technical precision, digital fluency, and conceptual innovation.

### **Course Objectives and Structure**

The programme focuses on:

- 3D garment modelling
- Digital garment creation
- Photorealistic 3D rendering
- Apparel product development
- Fashion DX (digital transformation)
- Multi-software digital pipelines

Students integrate traditional garment construction knowledge with digital workflows, enhancing both accuracy and creative control.

Industry-standard tools incorporated into the curriculum include:

- CLO
- Blender

Weekly sessions include:

- 3D Modelling
- CG Animation
- Digital Literacy
- Advanced Design Processes
- Digital Content Creation

The structure reflects a deliberate alignment between physical garment construction expertise and digital asset development.

### **Digital Fashion Program Collaboration**

Beginning in October 2024, Bunka Fashion College partnered with:

- Roblox
- Dentsu Group
- GeekOut

To deliver a pioneering five-month Digital Fashion Program embedded within the Virtual Fashion Course.

### **Student Activities**

- Created digital collections using Roblox Studio and the Layered Clothing system
- Designed both physical and virtual garments (“dual creation”)
- Presented work in virtual exhibitions where users could try on, vote for, and purchase digital garments

This integration of design, platform publishing, and digital commerce positions students within emerging fashion metaverse economies.

### **Outcomes**

The first cohort (21 students, graduating 2025) produced work blending digital and physical garment systems.

Reported outcomes include:

- Graduates securing employment within major apparel companies
- Strong industry alignment with digital transformation initiatives
- Demonstrated capability in cross-platform digital fashion development

The exhibition reflected professional-level rendering, advanced silhouette exploration, and cohesive hybrid design strategies.

### **Holistic Physical × Digital Design Philosophy**

Across undergraduate and postgraduate programmes, Bunka emphasises a Physical × Digital hybrid philosophy, integrating traditional craftsmanship with advanced digital systems.

This approach includes:

- Teaching students to construct real garments and virtual garments
- Embedding digital tools across design, sampling, presentation, and commerce
- Aligning education with digital fashion markets projected to exceed ¥16 trillion by 2030

The model does not position digital practice as separate from garment construction, but as an extension of technical and conceptual fashion expertise.

### **Career Pathways Emerging from Virtual Fashion Education**

Graduates from Bunka's virtual fashion-related programmes progress into roles such as:

- 3D Fashion Modeler
- Digital Fashion Designer
- Pattern Maker
- Production Manager
- Apparel Industry DX (Digital Transformation) Specialist

The curriculum prepares students for both traditional apparel companies undergoing digital transformation and emerging virtual fashion markets.

**14<sup>TH</sup> January 2026, follow up meeting with Prof. Takamura to discuss his research published in the Annual Design Review of Japanese Society for the Science of Design Number 26 2020**

### **Introduction - The Problem with 2D Fashion Design**

The authors begin by identifying a foundational issue in fashion creation. Garments are three-dimensional objects, yet most design processes originate from two-dimensional sketches. This creates a structural mismatch. A flat drawing must be interpreted into volume, depth, drape, and body interaction. As a result:

- Designers frequently correct or reinterpret forms during sampling
- The original silhouette may shift during translation
- Technical constraints reshape creative intention

The introduction establishes the central premise that fashion design may achieve greater accuracy and expressive potential if conceptualised directly in three dimensions rather than translated from 2D into 3D.

### **Aim of the Study - Designing Directly in 3D**

The stated aim is to develop and test a workflow in which designers conceptualise garments directly in 3D using digital tools

The research proposes a seamless chain: 3D Conceptualisation → 3D Simulation → Physical Garment Production. The objective is to demonstrate continuity between creative intention and realised garment, positioning this as a new methodology for fashion design.

### **Method Part 1 — Sculpting the Design in ZBrush**

ZBrush, typically used in animation, gaming and character modelling, functions as a digital sculpting platform allowing artists to manipulate virtual "clay."

### **Application**

- Modelled the garment directly within ZBrush
- Sculpted silhouette, curvature, and structural detail

- Explored volume without patternmaking constraints
- Avoided preliminary 2D drawing stages

### **Outcome**

The resulting digital model represented the pure conceptual intention of the garment, prior to technical adaptation.

This constitutes the study's core innovation:

A garment designed as sculpture rather than illustration.

### **Method Part 2 — Object-Based Form Verification**

Following sculpt development, the model was exported and materialised as a 3D output (e.g., 3D print or full rotational digital evaluation).

This stage enabled:

- Proportional verification
- Multi-angle inspection
- Structural assessment
- Evaluation of feasibility for textile translation

This object-based checkpoint introduces spatial validation before pattern drafting begins.

### **Method Part 3 - Translation into CLO 3D Patterns**

The second phase of the workflow involved importing the sculpted model into CLO.

As CLO enables:

- 2D pattern drafting
- Digital sewing
- Fabric simulation
- Fit testing in 3D space

### **Implementation**

Researchers:

- Used the ZBrush model as a volumetric guide
- Drafted pattern pieces aligned with the sculpt
- Assembled and simulated garments digitally
- Adjusted fit and fabric behaviour

This stage demonstrated how sculptural modelling can be converted into technically viable apparel construction.

### **Results Correspondence Between Concept and Garment**

The study reports a high degree of similarity between:

- The original ZBrush sculpt
- The CLO 3D simulation
- The final physical garment

This confirms:

- Sculptural intention can be preserved through digital-to-physical translation
- CLO can effectively derive pattern logic from 3D volumetric forms
- 3D-first workflows are technically viable in apparel production

The results address the long-standing tension between creative vision and technical realisation.

### **Discussion Implications for Fashion Practice**

The authors highlight many implications:

- Elimination of 2D Translation Errors
- Beginning in 3D reduces interpretive distortion between sketch and garment.
- Expansion of Creative Silhouette Development
- Sculptural tools allow exploration of complex, avant-garde, or volumetric forms difficult to visualise in flat drawing.
- Increased Prototyping Efficiency
- Digital validation reduces trial-and-error sampling cycles.
- Alignment of Creativity and Engineering
- Patternmaking becomes responsive to sculpted form rather than corrective of drawn representation.
- Bridging Artistic and Technical Disciplines
- The workflow integrates digital modelling, pattern engineering, and garment construction into a unified system.

### **Conclusion - A New Paradigm for Garment Creation**

The study concludes that the workflow, ZBrush → 3D Sculpt → CLO 3D → Pattern → Physical Garment represents a new possibility for garment design education and practice.

It demonstrates:

- A shift toward thinking directly in 3D
- A bridge between digital sculpture and sewn garments
- A hybrid creative–technical methodology
- A scalable framework suitable for advanced research environments

The authors position this approach as part of the future trajectory of digital fashion, particularly relevant for experimental, conceptual and research-driven design contexts.

### **Overall Conclusion**

The visit enabled detailed observation of teaching practice, the integration of digital solutions within the curriculum, and the scope of physical and digital resources available to students at Bunka Gakuen University. Direct engagement with studio delivery, software implementation and machine-based production provided valuable insight into how digital systems are embedded holistically from concept development through to final garment realisation.

The information gathered will be instrumental in evaluating and strengthening the use of digital technologies at Manchester Fashion Institute, particularly in relation to the rollout of SDS-ONE APEX4 and APEXFiz. Observing the relationship between virtual sampling, 3D simulation and direct production on Shima Seiki knitting

machines has provided a clearer understanding of how software and hardware integration can enhance efficiency, creative exploration, and technical confidence within knitwear education.

This comparative insight will support ongoing curriculum development, ensuring that digital knitwear delivery at Manchester Fashion Institute aligns with international best practice and fully leverages access to Shima Seiki machinery and associated design platforms.

The funding support from International Foundation of Fashion Technology Institutes (IFFTI) was instrumental in making this visit possible. Their contribution enabled direct international engagement, institutional benchmarking, and first-hand observation of advanced digital fashion pedagogy at Bunka Gakuen University.

Without this financial support, the opportunity to examine embedded digital workflows, specialist knitwear technologies, and industry-linked innovation at source would not have been achievable. The funding therefore played a critical role in facilitating research that will directly inform curriculum development, digital strategy, and international collaboration at Manchester Fashion Institute.