

Curriculum Innovation Based on User Research Topics

Tao Wang^{1,a,*}, Jingyi Zhan¹, Mengqi Xu¹

¹*School of Industrial Design, Guangzhou Academy of Fine Arts, Guangzhou, China*

^a*gzwt@163.com*

^{*}*Corresponding author*

Abstract: Starting from the teaching practice of user research courses, this article explores the innovative practices of the Industrial Design School of Guangzhou Academy of Fine Arts in design teaching. The course is based on the premise of free choice of physical products, and adopts project-based learning methods to drive students to explore the product functional environment. Innovative methods such as user research practice and multi perspective thinking training are cited to guide students to deeply analyze user needs from three dimensions: product functionality, service design, and user experience. The course innovatively introduces the "action indicator decomposition" and "consensus analysis method" to help students extract design insights from three levels: functional requirements, scenario requirements, and perceptual requirements, and combine interdisciplinary knowledge and technical tool applications to enhance students' practical abilities and innovative thinking. This article introduces the optimization and curriculum construction of the Industrial Design School of Guangzhou Academy of Fine Arts in design teaching. This article mainly cites the beverage vending machine products developed in the course, analyzes user behavior in different scenarios by understanding their functional characteristics and usage scenarios, and uses innovative methods to discover pain points in the purchase process guidance service and functional design of beverage vending machines, providing students with practical experience in user research and completing the course loop.

Keywords: User Research, Teaching Model, Beverage Vending Machine, Curriculum Innovation, Service Design, Navigation System

1. Introduction

With the advancement of technology, educational practices are gradually moving towards innovation, shifting from simply imparting knowledge points to enhancing students' grasp of knowledge through practical and innovative methods. Traditional design courses often focus on the accumulation of form and function, neglecting the deep exploration of students' behavior, needs, and experiences as real-world users, resulting in a lack of systematic analysis and problem-solving abilities when students face complex design issues. To address this, the School of Industrial Design at Guangzhou Academy of Fine Arts has launched a series of innovative practices centered around user research in its courses. The aim is to cultivate students' user insight, innovative thinking, and practical abilities through a teaching method that integrates theory with practice. This article takes the design of a beverage vending machine guidance system in a practical course as a practical case, exploring how to guide students to deeply analyze user needs and behavior patterns from multiple perspectives of product, service, and user through innovative teaching designs and methods. This helps students transform theoretical knowledge into practical design abilities [1][2].

2. Course Design and Teaching Objectives of User Research Courses

The purpose of the course and teaching is to enable students to proficiently apply user research methods, cultivate their understanding of user research, master research methods, enhance data analysis skills, and how to apply these skills to practical product design and master the basic rules and creative methods of product functional innovation. The proficient application of "Action Instruction Analysis" and "Consensus Analysis Method" is employed to review product appearance, functions, or service processes. By learning and understanding user research methods, students can systematically output product positioning, standardize design steps and processes. The output of product design needs to be

reasonable and evidence-based, using data as the basic indicator to explore deeper user needs and cultivate students' good product function analysis ability.

We will divide the course design into five parts:

2.1 Overview of User Research Fundamentals

User research plays a crucial role in shaping any successful product or service. Especially in the era of rapid development of the Internet, user research can help designers better position products, seize consumer pain points, and achieve high profitability and good design output. As a student studying design, studying user research is a compass for future employment and design production. By customizing user needs to ensure a core user experience, we provide a true advantage over our competitors. User research courses are also very important for cultivating students' user-oriented thinking and design abilities. After a better understanding of the fundamental theories of user research, students can better comprehend the origins of products that have been implemented, and thus design products that better meet user needs. In the course, students will be asked to share their experiences of user research in daily life through interactive Q&A sessions, such as "What sensory experience does this product provide you", "Does the product color match expectations", and the tactile experience of the product, in order to enhance the memory of other students [6].

2.2 Research Design and Implementation

After completing the understanding of the basic definition of user research, students will be free to choose physical products as the object of later user research analysis. The target audience should not be too imaginative, and priority should be given to whether the research object is a touchable group, avoiding selecting users with few physical products and difficult to reach as research and analysis objects, such as special populations, disabled people, disabled pets, and virtual characters. Choosing the wrong product in the early stage can lead to inaccurate data and difficulties in the practical process. Teachers will act as guides to inform students in advance of possible situations that may arise after selecting the topic. If students still have a strong interest in niche directions, they will be encouraged and assisted.[3].

2.3 Data Analysis and Insight

After finding the corresponding product, guide students to observe the corresponding population who choose the product, and write questionnaire questions based on the observation results to avoid writing questionnaire questions directly, which may lead to inaccurate data results or invalid questionnaire output. After the questionnaire is completed, face-to-face communication can be conducted through focus groups and 1V1 offline conversations. The real feelings of the respondents towards the product can be analyzed from various aspects such as facial expressions, text, and state. It is necessary to pay attention to combining the questionnaire questions. Considering that most of the respondents are non professionals, students who ask questions need to be guided more, and improvement methods for design functions, appearance, interaction, and other directions can be extracted from the answers. Data analysis is ultimately conducted, and innovation points suitable for design improvement are selected based on the sorting results [4].

2.4 Product Design and Application

After obtaining the corresponding results and data, ranking and summarizing will be conducted, and the design of functionality and appearance will begin. The function requires corresponding answers obtained from the questionnaire, such as "I think the handle is not easy to rotate". Students should analyze this statement from the perspective of a designer and consider it from multiple perspectives, such as human-machine issues, rotation angle issues, material issues, etc., and ultimately choose the most central question to improve; The appearance should be drawn and produced according to the size, color preferences, functional characteristics, and other factors of the target audience, while also considering whether the internal structure placement is reasonable [5].

2.5 Discussing Innovation and Future Trends

User research, as a core component of product design and development, is constantly evolving in terms of innovation and future trends with technological advancements and changes in market demand.

The future of user research will increasingly rely on technology and user engagement. With the popularization of emerging technologies and changes in social demands, designers need to constantly update their methodologies, have interdisciplinary collaboration, and always adhere to a user centered design philosophy to promote product innovation and experience optimization.

Through four weeks of courses and exploration, students gain a comprehensive understanding of the characteristics of innovative design methods. Based on their independent insights into user research, they present design works in group collaborations, analyze and improve product functions, service processes, and external structures, and formulate multiple types of reasonable design positioning after data analysis and in-depth questionnaire interviews.

3. Innovative Methodology

This course mainly applies two innovative methodologies, both of which are used to enable students to better analyze product issues and filter invalid data. User research, as one of the essential subjects for design students, is highly confusing. By using these two methodologies, students can quickly gain insight into the target requirements and reduce confusion during the design process.

3.1 Action Indicator Analysis Method

Behavioral indicator analysis is used to better understand the existing basic and expected functions of a product, that is, to discover opportunities for product development. It mainly includes behavioral requirement characteristics, style requirement characteristics, perceptual requirement characteristics, functional requirement characteristics, scenario requirement characteristics, and interaction requirement characteristics; The behavioral demand characteristics mainly focus on service products, which refers to whether the service behavior of service personnel is clear in the language transmitted between users receiving services and whether the behavioral expression is accurate. The vending machine products themselves tend to be service-oriented products, so the analysis of behavioral demand characteristics plays a crucial role in exploring the functionality of vending machine products. The accuracy of machine emotional expression during the purchasing process is equally important. The body language, facial expressions, and movement rhythm of service products can all affect users' overall experience of the service. A touch, a vibration, or a relaxing music playback can all convey friendly, respectful, or encouraging messages, thereby enhancing users' trust and satisfaction, and increasing their emotional value towards the product. Secondly, this optimization focuses on adding product features and expanding the service conversion of vending machines in different scenarios. The final selection includes functional requirement features, scenario requirement features, behavioral requirement features, and perceptual requirement features as the basis for early functional deepening [2].

3.2 Method of Seeking Commonality

The method of seeking common ground analysis can help students make accurate choices after obtaining a large amount of information, and obtain the most frequent and highest scoring results through seeking common ground comparison.

The main steps are:

- 1) Determine the research subjects. Select multiple cases or phenomena that need to be analyzed;
- 2) Organize materials. Observe the background, features, and relevant data of each product to determine the design starting point that best fits the product;
- 3) Find common ground. Comparing common features or conditions in data;
- 4) Inference rules. Speculation on common causes or patterns that may lead to these phenomena based on commonalities;
- 5) Verify the conclusion. Verify the rationality of the inference through further research or preliminary field experiments.

4. Course Practice and Feedback

In this course, we have selected relatively representative student works to demonstrate the reasonable

application of innovative methods in the curriculum.

The emergence of the self-service retail model has brought great convenience to daily life. It is not affected by location and manpower, has simple and convenient operation, and works well with modern and diverse payment methods and people's consumption patterns. Nowadays, it plays an increasingly important role in the lives of people in various regions and countries. However, the development of vending machines in China is relatively slow at present. Students observe the purchasing process of users and conduct surveys and questionnaire designs on their behavior. The conclusion has been drawn that problems such as a small number of sales categories, complex operation of machine navigation systems, and susceptibility to malfunctions are common among some populations. Data were collected to propose optimization suggestions for vending machine design, which further enhanced the functionality of the vending machine purchase guidance system and facilitated the rapid delivery of information [3].

4.1 The Application of Action Indicator Analysis in Teaching

The functional requirements of vending machines are mainly divided into consumption page function points and product processing function points. The basic function of the page is clear and concise information, which makes the consumption process easy and easy to understand how to select products, make payments, and pick up goods, ensuring that users can quickly complete the purchase process without complex steps. Vending machines should support multiple payment methods to ensure that users can use their most convenient payment method. Vending machines should be able to display fault information in a timely manner, reducing consumer confusion and dissatisfaction. The expected aspect is to have a functional interface that meets consumers' time saving needs; Provide users with the ability to quickly query information such as vending machine positioning distance, product type, etc; A functional interface that meets consumers' own health management needs; Personalized recommendation interface that caters to consumer groups; Simplify the operation steps while ensuring the security of the payment environment. The basic function of product handling is that consumers can clearly know how to take the product and conveniently take it, ensuring that the product supply is sufficient, clean, and easy to access. The expected surface is a functional processing method that protects consumers' hands when taking specific products (such as cold drinks and hot drinks), increases interest, and attracts consumers.

The scene demand characteristics of vending machines are mainly summarized as scene points in different seasons and special environmental sites. The existing beverage vending machines only have freezing function in different seasons, and some even do not have temperature control function. Their basic function should be to have refrigeration function and provide corresponding temperature conditions according to the type of goods. In future design, we expect vending machines to have immediate satisfaction for consumers' cooling behavior in high temperatures; Meet the seasonal needs of consumers in the face of climate change; Provide a functional experience that meets the convenience needs of consumers in rainy weather. In special environments, vending machines should be able to operate stably during peak hours or in areas with high foot traffic, without running out of inventory due to excessive foot traffic and unable to meet the basic usage needs of the local population. The expected future functionality is to reduce waiting time in scenarios with high foot traffic; Meet the user's quick query of vending machine positioning distance, product type and other information data; Ergonomic placement and orientation design of vending machines [4].

The characteristics of perceived needs involve multiple aspects, which mainly reflect the needs and tendencies exhibited by people when perceiving things. In vending machines, there are service process perception function points and process universality function points involved, and feedback is an important part of the service process. Users need to know whether the operation has been completed and what the results are when using it. This is the most fundamental and basic requirement in the process cycle. For the future process requirements of vending machines, there should be an instant feedback method for confirming purchase behavior, which is in line with consumers' choices. The method of recommending prompt sounds for hesitant behavior and the emotions of consumers waiting for the shipment of goods. Process universality is a key consideration for every type of service product. Consumers have different perceptions of different vending machine processes, and without commonalities, users are unsure whether their operations are appropriate. Insufficient button force, machine has stopped running, and operational errors all require a shared operation process display. The future transformation in the process will be based on rapid and immediate feedback, creating simplified steps with memory points [4].

4.2 Practical Steps

4.2.1 Research on the Current Usage Status of Beverage Vending Machines

Users of beverage vending machines are important factors that affect the service and design of beverage vending machines, including users' needs, convenience of product use, satisfaction with beverage vending machines, finding product pain points through centralized research on consumers, conducting user research and analysis, so as to clarify the service interaction process and functional demand characteristics of beverage vending machines, and put forward design optimization suggestions.

1) Research Method

The survey is divided into three parts, and through a progressive implementation policy, the process of "observation interview questionnaire" survey is carried out accordingly. The first step is to conduct on-site research around the beverage vending machine through road signs, using observation and recording methods to understand the general process of product use, as well as the specific situation of users using the beverage vending machine (as shown in Figure 1). The second method is to use interviews to summarize and observe the process of the previous step, and ask the relevant target audience about their thoughts and problems encountered during the use of the relevant process. The third one is a questionnaire, which summarizes the information from the interviews, compiles it into a standardized questionnaire, and sends it to different age groups to understand more people's needs and their questions.

2) Research Subject

Adopting a random sampling method, the research subjects are all people who use beverage vending machines, mainly concentrated in university teachers and students in Guangzhou University Town.



Figure 1: Field observation of the usage process of beverage vending machines

4.2.2 Analysis of Research Results

1) Analysis of the Location Area of Beverage Vending Machines

The location distribution of beverage vending machines is mainly based on factors such as pedestrian flow, consumption habits, and market demand. They are located in high flow areas such as commercial centers, schools, and hospitals. Beverage vending machines can provide convenient services and meet the demand of consumers for quick purchase of beverages in fast-paced life. These areas usually have high consumption potential and frequent purchasing behavior, making vending machines ideal sales points. In addition, large transportation hubs such as train stations and airports are also ideal locations for vending machines, as passengers in these places often need to conveniently and quickly purchase drinks. With the advancement of technology and changes in consumer habits, the location selection of beverage vending machines is constantly being optimized to meet the needs of different regions and consumer groups.

In the research project, students mainly observed beverage vending machines located in high traffic areas of universities, conducted simultaneous observation and random interviews, and recorded and analyzed the information obtained from observation and interviews.

2) Guide Information During the Purchase Process of Beverage Vending Machines

During the observation of the vending machine usage site, students found that due to the different models of beverage vending machines, there are certain differences in the selection and purchasing operations during the process of selling products. There are two main ways of selling and purchasing common beverage vending machines. One is to directly click the button below the corresponding beverage, select the purchased goods, scan the code for payment, and the beverage will fall freely from the inside of the machine to the pickup port; The second method is to first press the corresponding product code on the operating interface of the vending machine or directly select the goods on the screen, pay

and receive the beverage. Due to the increasing use of various payment methods such as mobile payments and facial recognition payments in beverage vending machines, many merchants also attach flowcharts or text prompts of the purchase process to the vending machine body, making it convenient for citizens to quickly understand and learn how to use these new shopping methods. When confirming that the design goal is based on the beverage vending machine service purchase guidance system in the user research theme course, we need to fully consider user experience, operational convenience, and effective communication of information to enhance the user's purchasing experience, while ensuring clear display of information. Therefore, the system should be able to provide an intuitive user interface, rich product information, convenient payment methods, and a good user interaction experience. To improve user purchase rates, optimizing interface layout and interaction processes can reduce the time consumption of users in selecting products and making payments; To enhance user experience, clear product information display, personalized recommendations, and friendly user feedback mechanisms can be provided; To promote sales growth, precision marketing and promotional activities can be used to increase product sales and user satisfaction; To achieve intelligent management, IoT technology can be used for remote monitoring and management, reducing operating costs and improving service quality. Through user research and the use of the "three-step decomposition method" in creativity, guide students to further explore and think about the topic. Through analysis, observation, and research, ultimately propose a solution direction, mobilize user thinking, and enable students to think and output solutions from multiple dimensions.

5. Analysis of User Consensus for Beverage Vending Machine Service Purchase Guidance System

5.1 Functional Requirements and Characteristics of Beverage Vending Machines

Based on the analysis and summary of user questionnaires and interviews, the most important feature of user functional requirements for beverage vending machines is the need to add a function to confirm the quantity of purchased products, clarify the steps in the product usage process, and optimize the layout of product pages when visiting products.

The functional requirements of beverage vending machines mainly include convenience, efficiency, diversity, intelligence, and safety. Specifically, they should provide a fast purchasing process, support multiple payment methods, and have cooling or heating capabilities to meet different temperature requirements. In addition, modern vending machines should also integrate intelligent inventory management systems to achieve real-time product monitoring and automatic replenishment reminders. Through interactive methods such as touch screens or mobile applications, users can easily select products and complete payments, enjoying a smooth shopping experience. At the same time, to ensure transaction security, vending machines need to adopt encryption technology and anti tamper design. These functions together constitute the core demand characteristics of beverage vending machines [3].

5.2 Characteristics of Scene Requirements for Beverage Vending Machines

The scene demand characteristics of beverage vending machines are mainly reflected in their adaptability and flexibility to different environments. In high traffic areas such as commercial centers, schools, hospitals, etc., vending machines need to have fast service capabilities to meet the demand of consumers for instant purchases in fast-paced life. In transportation hubs such as train stations, airports, etc., vending machines should provide diverse beverage options and support multiple payment methods to meet the needs of different passengers. In addition, for outdoor or remote areas, vending machines also need to have good weather resistance and stability to ensure normal operation in various environments.

In different scene environments, users have demand characteristics for beverage vending machines, including adaptive temperature storage function at different temperatures, temperature regulation at different temperatures, and real-time information synchronization between products and payment pages during the queuing process. In short, the scenario requirements of beverage vending machines require them to be able to flexibly adapt to various environments and provide convenient and efficient services [2].

5.3 Perception Demand Characteristics of Beverage Vending Machines

The perceptual demand characteristics of beverage vending machines are reflected in their keen

capture of consumer behavior and preferences, and should reduce the tedious page jumping during the payment process and increase the tactile feedback of buttons during the purchasing process. By integrating advanced sensors and data analysis technology, vending machines can monitor the sales status, inventory status, and purchasing habits of products in real time. These data not only help operators optimize product configuration and replenishment strategies, but also provide users with a more personalized shopping experience. For example, based on the user's purchase history and preferences, vending machines can intelligently recommend relevant products or promotional activities, thereby enhancing user loyalty and satisfaction. In addition, vending machines should also have a well-designed user interface to make the operation intuitive and easy to understand, further enhancing the perceived value of users [1].

The beverage vending machine service purchase guidance system needs to have intuitive and easy-to-use interactive interface, personalized recommendations, diversified payment methods, real-time inventory monitoring, user feedback mechanism, and remote intelligent management and other functional requirements. These features together constitute an efficient, convenient, and intelligent purchasing experience. In scenarios that meet the fast-paced and convenient needs of campus life, the system greatly enhances users' shopping experience by accurately sensing user needs, providing precise product information and promotional activities. At the same time, with the help of intelligent management methods, the system can reduce operating costs, improve service quality, and further enhance user satisfaction. The implementation of this comprehensive function not only meets the needs of modern consumers for convenient shopping, but also promotes the innovative development of the vending machine industry [5].

6. Conclusion

The processes and methods of user research are diverse. With the continuous progress of the Internet era, user research itself has been recognized and accepted by the public as a workplace demand and the premise of product production. It has obvious timeliness and periodicity. Like design education, the core of future design education is student-centered, focusing on practice, technology integration and updated learning. Through innovative design, education will be more flexible, inclusive, and efficient, helping students adapt to a rapidly changing world. Good application of design methods requires long-term practice, as well as innovative ideas, methods, and theories. Therefore, it requires the unremitting efforts of design practitioners to innovate, improve their cognition, update their theories, promote method innovation, and make breakthroughs and breakthroughs in processes and applications. Students need to be constantly encouraged to be good at applying design methods reasonably in product output. User research is just one of the methods for product output. As a designer, it is necessary to be able to combine methods and practice in a reasonable way, and to combine flexible thinking and innovation, which is the future trend of young designers in the new era. This course explored new design methods and gave us a lot of thinking and inspiration. As long as there are items, there is a need for users. As long as there is a society, there is an environment and soil with research conditions that can explore and ferment innovative products. With better user research methods, we can guide ourselves as users to "step into a better tomorrow".

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