Teaching Implementation and Innovation of Design Practice Course With Application of ARCS-V Motivational Model

Luo ShiChen, National Yunlin University of Science and Technology, Taiwan
Tu Jui-Che, National Yunlin University of Science and Technology, Taiwan

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Abstract
In response to the changing internet era, teaching strategies must adapt. Particularly, students in design programs must not only possess creativity and practical design skills but also demonstrate social empathy and the ability to solve real-world problems. In past teaching scenarios, it has been observed that students, influenced by digital technology, often lack observation and experiential understanding of the surrounding world. This deficiency leads to a lack of empathy in the conceptual development process of design and a gradual loss of the ability to explore and analyze user needs. Therefore, this study introduces the ARCS-V motivation model into design courses, aiming to enhance students' four key abilities: "Adaptation to Learning," "Exploration of Learning," "Observation in Design," and "Application of Learning." Through methods such as pre-and post-course surveys, non-participant observation, and focus group interviews, the study evaluates students' learning outcomes. The results indicate that the ARCS-V motivation model improves students' learning motivation and the four key abilities mentioned. During interviews, students expressed that the engaging nature of the design topics significantly enhances their learning focus, increases practical design skills during the course, and is perceived as applicable in future workplaces. Eventually, the results obtained through this research, it is not only can improve students' learning initiative and learning effectiveness, but also can cultivate students' perception in the living environment, thereby solidifying the foundation of students' design practical ability. It can also be used as a reference for design practice teaching of other related design education fields and curriculum planning.

Keywords: ARCS-V Motivational Model, Design Education, Teaching Innovation

Introduction

Innovations in digital technology have led to the emergence of a new knowledge society, with multiple and easily accessible learning channels expanding the scope of "design" significantly. In today's era, the standard for good designers has risen; they are expected not only to excel in design but also to possess the "2I" ability—Insight and Integration (Shao, 2019). Particularly after the outbreak of COVID-19, the overall teaching environment and methods have evolved. Learning now extends beyond schools and families to a broader, globalized context (Biwer et al., 2021). The application of various teaching tools and digital devices has transformed traditional teaching modes, creating a sense of estrangement between teachers and students, as well as among peers (Liao, 2022). The impact of the epidemic in recent years has shown that digital technology indeed influences the nourishment and guidance needed in practical design courses. Students are inundated with information devices and online resources, leading to a lack of motivation, difficulty concentrating, and challenges in exploring new knowledge independently, which contradicts the proper cultivation of design talents in this era.

Therefore, teaching methods and strategies in design education need to keep pace with the times. Effective teaching methods and strategies can not only spark students' interest in learning but also increase their concentration, motivation, desire to challenge, and ability to seize learning opportunities. This is crucial in guiding students' learning adaptability. Design students, in particular, should possess creativity, design practice skills, social empathy, and problem-solving abilities. Empathy, as a key foundation for understanding audience needs, is a crucial process in human-centered design (Foster, 2019; Rosa et al., 2021; Liu et al., 2024). However, students today often lack observation and experience with their surroundings, impairing their ability to empathize with target groups during the development of design concepts. This results in a lack of deep thinking and reflection in design concept development, and insufficient consideration of market demand practical application, making design concepts vague or merely formal.

Papanek (2005) argues that the main problem with design education is its disconnection from the real world, with theoretical knowledge remaining abstract and detached from reality. While traditional design education forms an important infrastructure for design knowledge, it may not fully meet the needs of contemporary society (Norman, 2017). Today's designers' responsibilities are expanding from technical to organizational and managerial levels. To solve complex, large-scale design problems in the future, it is essential to nurture design students' organizational and managerial skills to support the application of traditional design skills (Meyer & Norman, 2020). The ARCS-V motivation model, developed by Professor Keller of Florida State University in the late 1970s, focuses on stimulating student interest and motivation. This model emphasizes five key elements: Attention, Relevance, Confidence, Satisfaction, and Volition, to motivate students to learn (Changes and Adaptations:, 2010). The model considers both internal student factors and external teaching environment factors, helping educators understand students' learning needs and develop strategies to enhance their interest and performance. Many studies have shown that the ARCS-V motivation model can trigger and maintain student motivation, enhancing learning effectiveness and persistence (Changes and Adaptations, 2010; Deimann & Bastiaens, 2010; Keller, 2012; Ucar & Kumtepe, 2020).

At the same time, adaptability is essential for individuals to live in harmony with their environment. Good adaptability means that individuals can adjust their needs and

continuously make dynamic and static adjustments with the environment, adopting positive attitudes and strategies to solve problems in environmental interactions, thus achieving harmonious and stable self-realization (Simons et al., 1994). Summarizing the definitions of experts and scholars, learning adaptation is defined as an individual's ability to adjust to the overall learning environment, commitment to learning, and sense of belonging during the learning process. This includes the capacity to use appropriate strategies and resources and adjust one's attitude when encountering difficulties and challenges to solve learning problems and difficulties (Ting & Yeh, 2021).

When students face a digital teaching and learning environment, they need stronger autonomy and resource management strategies to adapt to the complex and changing social environment and accept new challenges and stimuli. However, for many students, adapting to a high level of autonomy and successfully applying various resources to their studies in the early years of college is challenging (Rasheed et al., 2020; Biwer et al., 2021). The World Economic Forum (WEF) proposed a new education paradigm in January 2020. In the era of industrial innovation towards automated production and value creation, education faces a critical moment of change in the content and experience of learning, with lifelong learning and self-directed learning at its core (World Economic Forum, 2020).

In recent years, there has been a growing trend of exploratory education and self-directed learning in Taiwan, aligning with current educational goals of naturalization, living, teamwork, and the value of trust. In the systematic teaching process, instructors guide learners to experience, reflect, and practice from activities to expand their potential (Pan, 2018). Therefore, in the face of the complex and diverse information on the Internet, school education should help students maintain their motivation and passion for learning. It should guide them to learn through the interaction of self, others, society, and nature, cultivating them to become independent learners with a spirit of exploration (Hung, 2020).

For designers, observation is a crucial way to understand and evaluate users' experiences of a product or service. By observing and analyzing users, designers can determine whether their concepts and products meet real societal needs. Observation involves more than just looking with the eyes; it includes activating different perceptual senses to collect data, analyzing and interpreting this data in a goal-oriented manner, and then exploring the problems behind phenomena to find solutions (Boudreau et al., 2008). Observation is also a way of learning new things and broadening horizons (Bandura, 1977). Therefore, apart from learning professional design knowledge in the classroom, students can internalize what they have seen and heard in daily life through observation. Good observation of life helps designers collect users' daily habits and behaviors and enables them to think about solutions from different perspectives. This, in turn, can promote the innovative development of product design.

In a practical product design course, students need not only basic knowledge of product design but also empathy and understanding of the living environment and social issues. This allows them to apply their knowledge to solve social problems and meet needs. In light of future social trends and development, teachers should consider how to use teaching design to guide students in effectively utilizing digital resources and tools to achieve creative design practice, cultivating pragmatic design talents with innovative thinking. Accordingly, this study integrates the ARCS-V motivation model into the core design courses of the Department of Creative Life Design at National Yunlin University of Science and Technology, focusing on second-year students. The goal is to develop four important design core competencies: "learning to adapt," "learning to explore," "design observation," and

"learning to use," addressing issues identified in the teaching scene.These four core competencies are described in detail below:

1. Learning Adaptability (LA): To shorten the transition period of course articulation and enhance students' motivation and positive attitude towards learning.
2. Exploration Learning (EL): To enhance students' motivation and ambition to actively and deeply explore problems.
3. Observation (OB): To enhance students' ability to observe social phenomena during conceptual development, leading to design solutions that address problems.
4. Learning to Apply (LTA): To cultivate students' ability to implement design concepts and ideas in practice.

The Product Design Practicum course is divided into five stages: "Introduction to Topic," "Problem Exploration," "Proposal Conceptualization," "Design Practice," and "Final Presentation." This structure guides students in creating design proposals that align closely with the course theme and practical applications. Students are expected to progressively acquire basic design skills at various stages of the course. The overall study structure is shown in Figure 1.

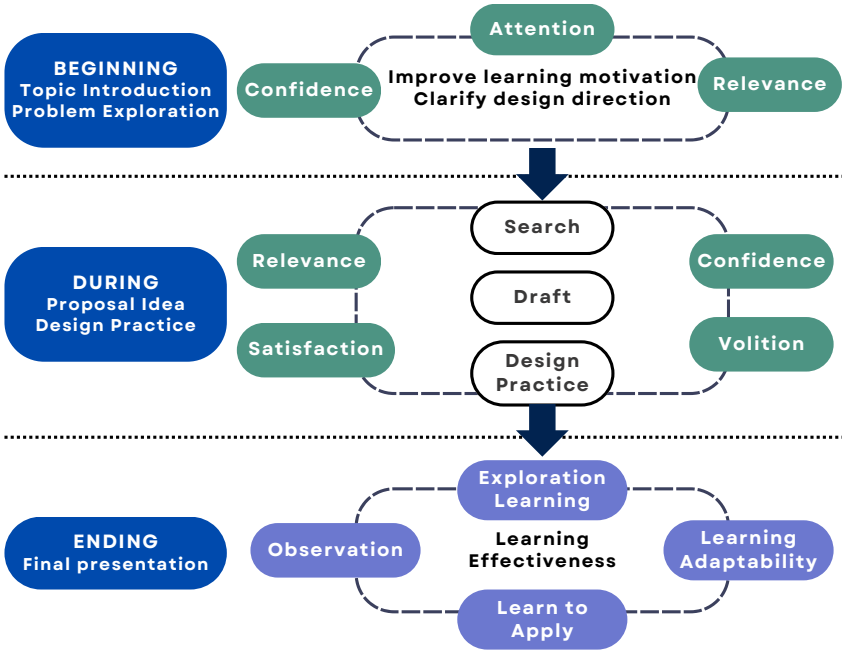

Figure 1: ARCS-V Motivational Modeling into Teaching Innovation Research Framework.

Methodology

This course, "Creative Life Design (I) (II)," spans a full academic year, with each segment lasting six weeks, focusing on innovative product design practices. The course employs both group and individual learning approaches. The research subjects are 39 sophomore students from the Department of Creative Life Design at National Yunlin University of Science and Technology, comprising 4 male and 35 female students. All participants have completed basic design courses in their first year and possess certain product design skills.

For this study, a pre-course and post-course questionnaire survey was conducted. Participant observation was employed during weekly classes to monitor interactions among students, teachers, and peers, and focus group interviews were conducted after the course concluded.

The results from these three assessments were analyzed to identify improvements in teaching and learning. The findings on teaching innovations were compiled and used to evaluate teaching effectiveness, as shown in Figure 2.

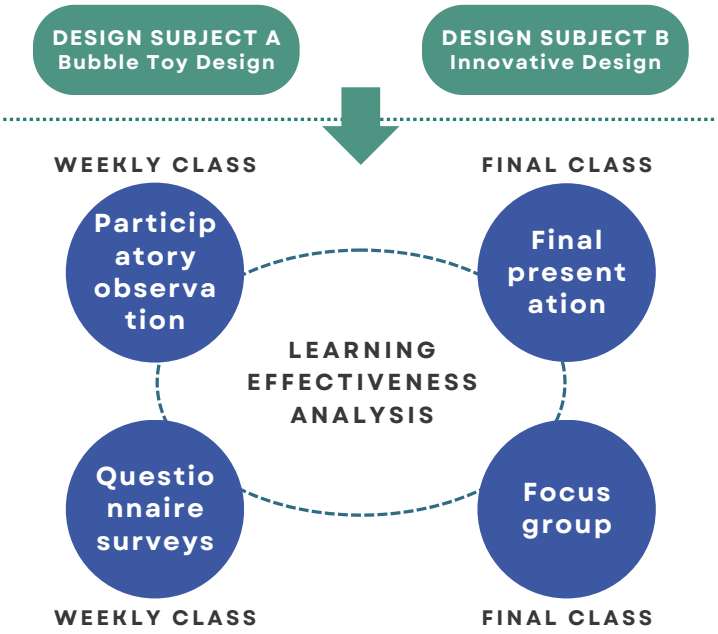

Figure 2: Course design and process.

To assess the learning status and effectiveness of the students in the design practice course, the researcher conducted pre-test and post-test questionnaires. The content of the questionnaire was based on Keller's (2010) IMMS scale and the Volition part of Liu (2003) Learning Motivation Scale, comprising a total of 47 questions. Experts were invited to review and revise the questionnaire content. Additionally, students were asked to complete the "Self-Assessment of Competence" (15 questions in total) simultaneously. This self-assessment allowed students to reflect on their learning process, identify difficulties, and provide timely feedback to teachers, promoting continuous learning and improving learning outcomes (Broadfoot et al., 2002; Klenowski, 2009).

Result

To evaluate the effectiveness of students' learning in the product design course, this study utilized a paired-sample t-test to analyze the questionnaire survey data. Significant differences were found in "Attention," "Relevance," "Confidence," "Satisfaction," and "Volition" before and after the course.

Table 1: Analysis of ARCS-V motivation survey pre-test and post-test

	N	Pre-test		Post-test		*t*	*p*	Cohen's *d*
		Mean	SD	Mean	SD			
Attention	39	3.51	0.34	3.69	0.41	-2.06	.046*	.331
Relevance	39	3.64	0.36	3.93	0.43	-3.04	.004**	.487
Confidence	39	3.22	0.30	3.75	0.38	-6.18	.000***	.989
Satisfaction	39	3.65	0.37	4.00	0.51	-3.49	.001**	.560
Volition	39	3.59	0.46	3.89	0.53	-2.62	.013*	.419

*p****<0.001, *p* **<0.01, *p* *<0.05

In order to understand the relationship between the differences in the four competencies of the students, paired-sample t-tests and correlation analyses were conducted. As shown in Table 2, out of the four sets of paired data, three sets exhibited anomalies.

Table 2: Student's four key competencies: Matching samples for testing.

	N	Pre-test		Post-test		*t*	*p*	Cohen's *d*
		Mean	SD	Mean	SD			
Learning Adaptability (LA)	39	3.49	0.57	3.98	0.48	-4.252	.000***	.648
Exploration Learning (EL)	39	3.51	0.66	3.83	0.64	-2.178	.035*	.332
Observation (OB)	39	3.89	0.56	4.07	0.63	-1.566	.125	.239
Learn to Apply (LTA)	39	3.58	0.73	3.98	0.74	-2.240	.030*	.342

Interviews revealed that, at the beginning of the course, students had difficulty adapting to the design software and learning teamwork. However, after the course, students reported that the engaging nature of the design theme and its introduction significantly enhanced their attention to the learning process. The design materials used in the course were traditional natural materials from Taiwan, which students found meaningful. They felt that the design topic represented an innovative combination of Taiwan's traditional culture and modern culture, making it a highly valuable design experience.

Conclusion

In view of the above, the four key competencies corresponding to each stage of the ARCS-V motivation model in the design course are summarized in Figure 3 below. The four teaching methods of Attention, Relevance, Confidence, and Volition are applied before the course begins (Topic Introduction). Interesting case studies are used to stimulate students' interest in learning, and discussions guide them to make connections to daily life. Students can freely choose their topic groups, enhancing their acceptance of the course.

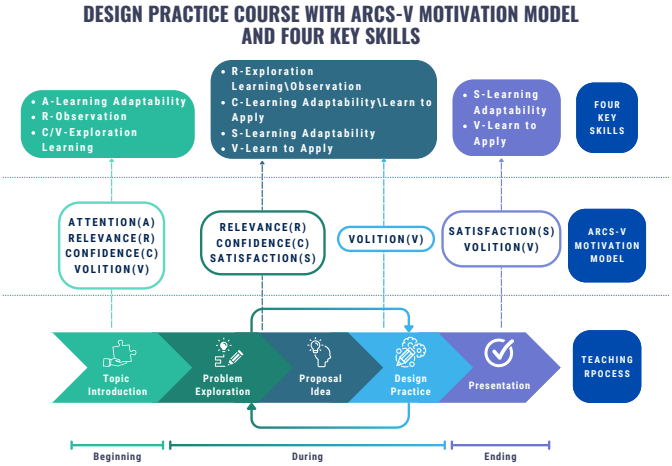

Figure 3: Design practice course with ARCS-V motivation model and four key skills

During the course, the stages of Problem Exploration, Proposal Idea, and Design Practice are carried out cyclically. The four teaching methods of Relevance, Confidence, Satisfaction, and Volition are utilized. In brainstorming sessions and teacher-student discussions, the Relevance strategy guides students to observe the people and things around them, establishing real and reliable target groups and their needs. Various teaching methods, such as off-campus teaching and lectures, allow students to learn through play and practical experiences, differing from digital learning.

In the design proposal process, students need guidance to set challenging yet achievable design goals. Increasing students' access to software and design tools (e.g., factory learning) helps them overcome the frustration of having ideas but not being able to realize them. The final course presentation employs the Satisfaction and Volition strategies, providing a venue for students to showcase their work and strengths, increasing peer communication and interaction, and enhancing their presentation skills. This prepares them to adapt flexibly to various social environments in the future.

Differences were found between the two groups in terms of motivation, exploration, and depth of design concepts. Although the theme of "Bubble Toys" was closer to daily life, the students' works lacked a sense of life and detailed thinking. Conversely, the "Tetrapanax papyrifer in Taiwan" group demonstrated more exploratory and innovative designs. In understanding the new material, students had to consider its social applicability and innovative value, resulting in product designs applicable in various aspects of life. This may be due to two reasons: the simplicity of the theme, which left little room for creative extension, and the students' interest in the theme. During focus group interviews, it was clear that students preferred the "Tetrapanax papyrifer in Taiwan" theme. Quantitative analysis also showed no significant change in students' design observation abilities.

During discussions with students, it was found that some lacked clear product design concepts and often expressed confusion, such as "I don't know why I have to do this design." This indicated they had not yet mastered the systematic design process or utilized their design observation skills effectively. This needs to be addressed in future teaching.

Given the limited number of students in this course, future efforts can expand the student base to test the impact of different design themes on critical abilities and learning interests. Additionally, teaching methods can be refined based on student feedback to enhance their creativity and independence. This will further improve the learning potential and future competitiveness of Taiwanese design students in the job market.

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Contact email: lousccc1009@gmail.com