

Motivational Issues in Visual Design Education: Improving Teaching Methods From the Perspective of Self-Determination Theory

Huiwen Sun, Albert Young Choi
Hanyang University ERICA, Ansan, South Korea

In the process of optimizing modern higher education in visual design, if educators can adopt advanced teaching concepts and actively explore issues related to students' learning motivation, it can significantly enhance students' initiative in learning while making the teaching process more targeted and effective. Motivation, as the key factor driving individuals to take action and achieve specific goals, directly affects students' enthusiasm and creativity. Teaching strategies based on motivation can improve educational outcomes. The Self-Determination Theory provides a framework for enhancing students' intrinsic motivation, emphasizing the fulfillment of three basic psychological needs: autonomy, competence, and relatedness. Satisfying these needs allows students to demonstrate stronger learning motivation and sustained interest. Higher education instructors can support autonomy by giving students more choices, allowing them to create based on their interests, thus fostering creativity and increasing engagement. Additionally, teachers should provide competence support by setting appropriately challenging tasks, helping students gradually improve their skills and confidence, and enhancing their sense of competence. Finally, relatedness support emphasizes creating a collaborative learning environment where students can strengthen emotional connections and perceive the value of learning through group cooperation and discussions. Optimizing visual design education not only requires attention to motivation issues but also necessitates designing teaching strategies based on the Self-Determination Theory. Through support for autonomy, competence, and relatedness, educators can effectively stimulate students' intrinsic motivation, and enhance their creativity, problem-solving abilities, and interest in long-term learning. This approach makes education more meaningful and valuable, helping to cultivate more outstanding design talents.

Keywords: Self-Determination Theory, visual design education, motivational issues, teaching method improvement

Introduction

Research Background and Objectives

From a psychological perspective, motivation mainly refers to the idea that drives people to engage in certain behaviors. From an educational psychology perspective, motivation is mainly divided into intrinsic motivation and extrinsic motivation. Students' learning motivation is the driving force of learning activities, which can improve the efficiency and quality of students' learning. When visual design education teachers explore teaching

method improvement strategies from the perspective of Self-Determination Theory in the new stage of educational development, they can discover students' learning problems based on the overview of Self-Determination Theory, provide meaningful reasons, or reflect on teaching behaviors, acknowledge conflicts, etc., so that visual design education can obtain better reform and innovation from the perspective of Self-Determination Theory, so that students can improve their academic performance and strengthen their practical skills.

In the new stage of educational development, teachers in visual design education can base on the fact that the greatest value of visual design is to create value for customers, rather than to make fixed judgments based on good-looking or bad-looking standards, and the value of artistic vision lies in activation and creation. The first visual value is creation, and the second is activation. When exploring effective visual design teaching methods from the perspective of Self-Determination Theory, instructors accurately guide students to learn the transformation of the two, so that students can stand on overthrowing the previous artist based on any artistic visual creation, and ensure that students continuously improve their visual design level in the process of visual design.

Overview of Self-Determination Theory

Self-Determination Theory (SDT), proposed by psychologists Edward Deci and Richard Ryan in the 1980s, is a psychological theory that explores human motivation and personality development. The core idea of this theory is that individuals' behavior is not only influenced by external rewards but is primarily driven by intrinsic motivation. SDT emphasizes that intrinsic motivation is key to driving human behavior, and when people feel autonomous in their choices and experience inner satisfaction, they are more likely to engage in activities with greater enthusiasm and achieve ongoing growth and well-being.

SDT posits that individuals' behavior and motivation are primarily influenced by the fulfillment of three basic psychological needs: competence, relatedness, and autonomy. The extent to which these needs are met directly determines whether individuals can maintain intrinsic motivation, which in turn affects their performance and development.

Firstly, competence refers to an individual's perception of effectiveness in facing challenges, solving problems, and completing tasks. Fulfilling the need for competence means that an individual feels capable of successfully completing tasks and overcoming difficulties. This perception enhances their confidence in their abilities, motivating them to engage more fully in learning or work. In the field of education, when students receive positive feedback after completing tasks and feel that their abilities have improved, they tend to develop greater interest and motivation for learning.

Secondly, relatedness refers to the sense of connection and belonging that an individual feels in interactions with others. Fulfilling the need for relatedness means that an individual feels supported, accepted, and understood within a group. Good relationships with others can strengthen one's sense of social connection and security, thereby enhancing intrinsic motivation. For example, in an educational setting, positive interactions between students, teachers, and peers can help students feel valued within the group, which fosters a sense of belonging that enhances their motivation to learn and encourages greater engagement. Additionally, relatedness plays a key role in promoting mental health. When individuals feel supported and cared for in social interactions, their psychological stress is alleviated, which contributes to better mental health.

Finally, autonomy refers to the sense of freedom and control individuals experience in their actions and decisions. Fulfilling the need for autonomy means that individuals can make choices based on their own interests

and values, rather than due to external pressure or the directives of others. When autonomy is respected and supported, individuals are more likely to find intrinsic meaning in their actions and derive deeper satisfaction from them. In education, when students are given some degree of choice in their learning process and can participate in decisions regarding learning goals and methods, they often exhibit greater enthusiasm and responsibility. Autonomy stimulates individuals' intrinsic drive, making them more inclined to engage in active learning and exploration.

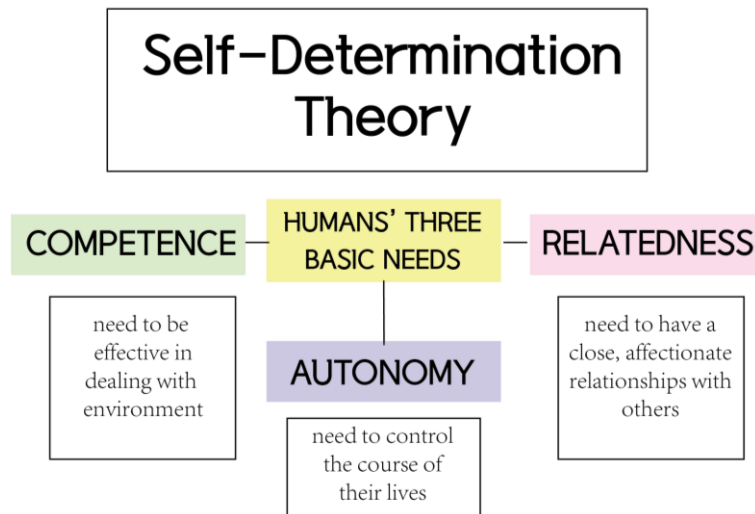


Figure 1. A diagram showing the specific elements required for competence, relevance, and autonomy under SDT theory.

Analysis of the Sources of Motivation for Self-Determined Behavior

Firstly, the most important source of information for generating motivation and providing energy for behavior is the initial series of drives. Drives are the primary forces that propel individuals to take action, serving as a motivation to initiate self-determined behaviors. These drives often stem from internal physiological and psychological needs, such as hunger, thirst, or the desire for knowledge. They operate in a cyclical manner, meaning that once a drive is satisfied, the individual experiences a sense of fulfillment and the behavior ceases; however, when the drive reappears, the cycle is reactivated. For example, a student driven by a desire for knowledge will actively engage in learning. Once this need is met, they will feel satisfied, but as knowledge continues to accumulate and the external world changes, this need may reemerge, prompting them to continue learning. Drives play an initiating role in the motivation generation process, providing the initial energy for an individual's behavior.

Secondly, wisdom and the inner need for self-determination are the second key sources of information for forming motivation. Inner needs include personal growth, the desire for self-actualization, and the pursuit of autonomy and independence. Compared to basic drives, inner needs are more complex and continuously evolving. They are not triggered by immediate needs but develop as individuals gain experience, learn, and deepen their self-awareness. For instance, a person may take on a long-term, challenging task because they desire higher achievements in their career or seek self-fulfillment. These inner motivations tend to provide sustained energy and direction to behavior, helping individuals face challenges and overcome difficulties. By satisfying these inner needs, individuals can experience higher levels of satisfaction, such as self-esteem and a sense of accomplishment. The need for wisdom and self-determination not only guides individuals in regulating and managing their behavior but also helps to adjust their drives, allowing them to approach challenges more rationally.

Finally, emotions, like drives and inner needs, also provide key information that can lead to purposeful behavior. Emotions play a dual role in this process, acting both as a precursor and a consequence of behavior. In Self-Determination Theory, emotions are seen as a source of information, providing energy for behavior even before it occurs. For example, when individuals feel excited, curious, or hopeful, these positive emotional states can encourage them to engage more actively in an activity. Conversely, when they feel anxious or frustrated, negative emotions may hinder their actions. Emotions are also outcomes of behavior. For instance, when an individual successfully completes a task, they feel satisfaction and joy, whereas failure to complete the task may lead to frustration or disappointment. Through this feedback mechanism, emotions continually provide information, helping individuals adjust their behavioral strategies.

Because drives, inner needs, and emotions are intertwined, they not only influence motivation and behavior generation but can also interfere with one another. For example, when drives align with inner needs, motivation becomes stronger, and behavior tends to be more persistent. However, if drives conflict with inner needs or emotions, individuals may experience internal struggle, which can affect the outcome of their behavior. Therefore, researchers often suggest combining these three motivational sources to form multi-layered motivation, resulting in more stable and powerful motivation. In this way, individuals can maintain high levels of autonomy and initiative when facing complex environments and challenges, allowing them to achieve their goals and experience the expected satisfaction.

In conclusion, drives, inner needs, and emotions serve as the three key sources of motivation in Self-Determination Theory, playing crucial roles in the generation of behavior and motivation. They influence each other, providing energy for actions while also helping individuals adjust their behaviors through feedback mechanisms to fulfill internal needs and achieve external goals.

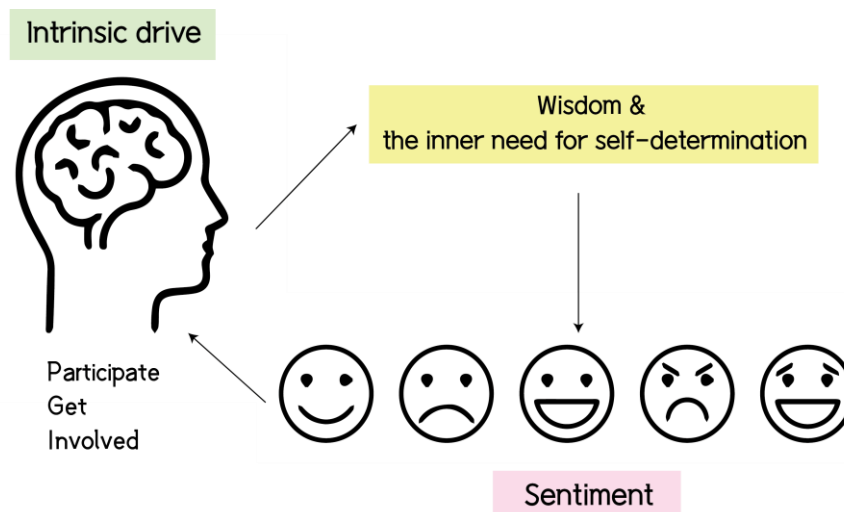


Figure 2. A diagram showing the relationship between motivation, wisdom, the intrinsic need for self-determination, and emotions from the perspective of Self-Determination Theory.

Methodology

Introduction to the Self-Determination Theory Motivation Model

This chart illustrates the types of motivation within the framework of Self-Determination Theory (SDT), and it closely links them to the three basic psychological needs of humans. SDT emphasizes the importance of

intrinsic motivation, proposing that individuals' behavior is driven not just by external rewards, but more importantly by the satisfaction of psychological needs for autonomy, competence, and relatedness. The chart lists these three basic psychological needs: the need for autonomy, the need for competence, and the need for relatedness, and demonstrates how these needs are expressed through different types of motivation. The chart categorizes motivation into intrinsic motivation, extrinsic motivation (with four different forms of regulation), and amotivation, explaining the relationship between each type of motivation and human behavior.

Firstly, intrinsic motivation represents the highest level of autonomous motivation. It refers to actions taken by an individual for the inherent pleasure, enjoyment, or satisfaction derived from the activity itself, rather than for any external reward. For example, a student might actively engage in learning simply out of curiosity and interest in a subject. This type of motivation does not require any additional rewards or external drivers. In the case of intrinsic motivation, individuals feel that their behavior is fully autonomous, and it satisfies their needs for autonomy, competence, and relatedness. This is considered the most ideal state in SDT, as it fosters sustained engagement in activities and leads to a high level of well-being and accomplishment.

Next is extrinsic motivation, where behavior is driven by the desire to gain external rewards or avoid punishment. However, the degree to which extrinsic motivation is internalized can vary, leading to different expressions of extrinsic motivation. The chart categorizes extrinsic motivation into four types, listed in order of decreasing autonomy: integrated regulation, identified regulation, introjected regulation, and external regulation.

1. Integrated regulation is the form of extrinsic motivation that is closest to intrinsic motivation. In this case, an individual's behavior is fully aligned with their personal values and goals, and the external motivation has been fully internalized. Although the initial motivation may have been external, the behavior now feels self-determined because it aligns with the individual's sense of self. For instance, a designer might proactively learn new skills for personal growth or career advancement. While this behavior is driven by external goals, it has become an integral part of their personal growth.

2. Identified regulation occurs when an individual behaves based on personal values or goals that they acknowledge and accept. This type of motivation is partially internalized, and the individual is willing to invest time and effort because they recognize the importance of the behavior in achieving their personal objectives. For example, a student might study a subject because they believe it is crucial for their future career.

3. Introjected regulation involves actions driven by internal pressures, such as the desire to avoid feelings of shame or guilt or to gain approval from others. While introjected regulation displays some level of autonomy, it still carries a strong sense of external control and pressure. For instance, a student might work hard to avoid criticism from their teacher. Although this motivation is not entirely external, it is still influenced by external factors.

4. External regulation is the most typical form of extrinsic motivation. It refers to behavior that is entirely driven by the desire to gain external rewards or avoid punishment. For example, a student might study to earn good grades or win a scholarship. In this case, the behavior is directly driven by external forces and exhibits the least amount of autonomy.

Finally, the chart presents amotivation, which represents a state where an individual lacks motivation entirely. In the case of amotivation, the individual does not see a connection between their actions and the outcomes, and thus, they lack both intrinsic and extrinsic drivers for behavior. Amotivation can stem from a sense of helplessness, unclear goals, or a lack of confidence in one's abilities. For example, a student may feel unmotivated to engage in any learning activities due to a lack of interest or direction.

The chart also depicts a continuum of relative autonomy, showing how the degree of autonomy changes from high (in intrinsic motivation) to low (in external regulation and amotivation). The degree of autonomy determines the persistence and engagement in behavior. As a result, researchers often recommend enhancing individuals' intrinsic motivation or increasing the internalization of extrinsic motivation to foster long-term motivation and improved behavioral outcomes.

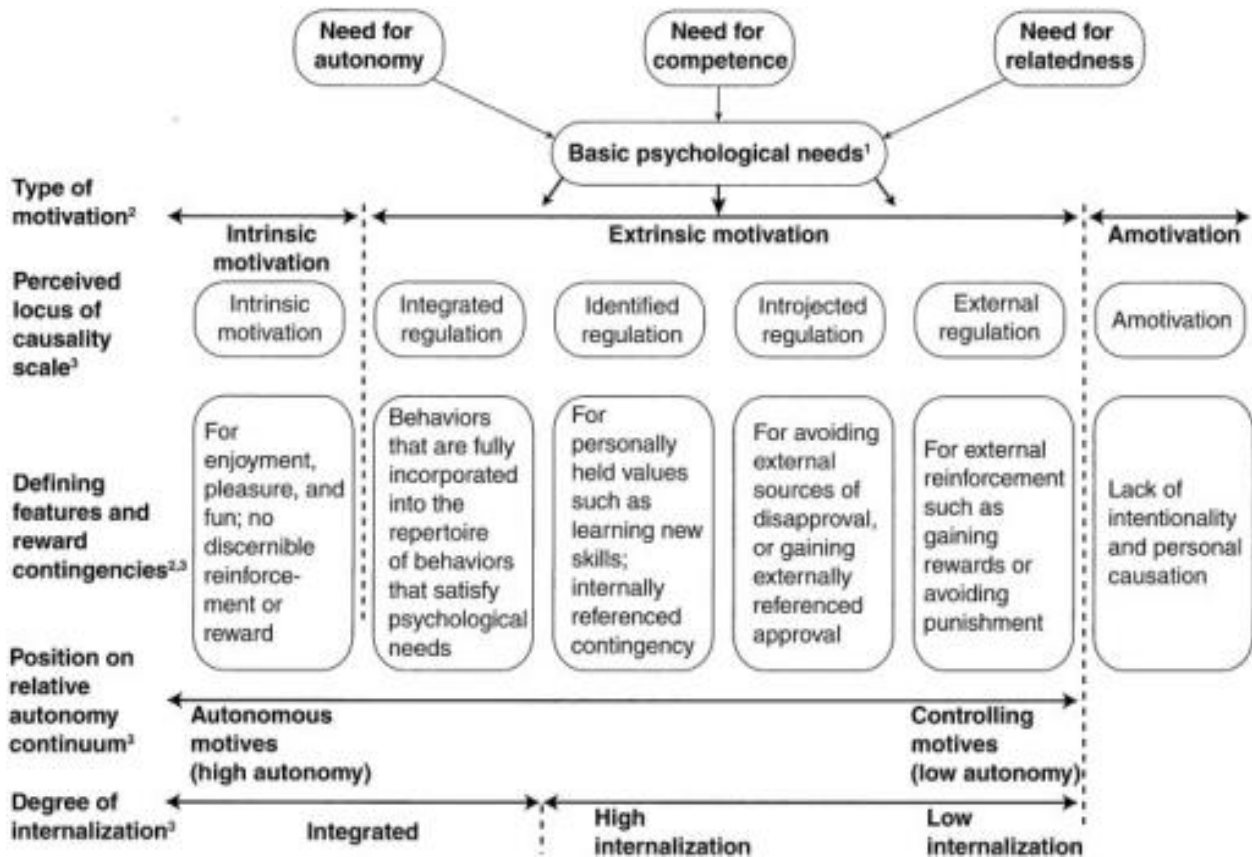


Figure 3. Self-Determination Theory motivation model diagram.

Effective Strategies for Improving Teaching Methods in Visual Design Education From the Perspective of Self-Determination Theory

Under the framework of Self-Determination Theory (SDT), the improvement of teaching methods in visual design education can bring greater flexibility and personalization to university-level visual design courses, helping students better adapt to future design practice. SDT posits that humans are active organisms with inherent psychological potential for growth and development. This internal motivation can guide individuals to engage in activities they are interested in and that enhance their capabilities. Therefore, visual design educators can, in the process of exploring teaching method improvements, rely on the principles of SDT to enhance students' intrinsic motivation. By effectively applying SDT to educational practice, educators can ensure that students achieve optimal growth and development in their learning. The following sections provide a detailed discussion of several strategies for improving teaching methods in university-level visual design courses based on SDT, offered as reference.

1. Teachers identify students' learning problems and provide meaningful reasons: In university-level visual design courses, teachers can apply SDT to optimize teaching methods by focusing on the development of students'

intrinsic motivation. Throughout the teaching process, educators should recognize that different students have varying interests in specific areas of visual design, and they need to provide meaningful learning reasons to tailor teaching plans and strategies accordingly. For instance, visual communication design is a vital art form in modern commercial services, encompassing logo design, advertising, and packaging design, among others. Teachers can use questionnaires and other tools to assess students' interests in different design fields, allowing for the creation of more targeted course content.

For example, for students interested in advertising design, teachers can guide them in understanding the core principles of advertising creativity and the use of visual elements in advertisements. For those interested in packaging design, the course can focus on how to express brand identity through design and attract consumer attention. Such teaching methods not only meet students' individualized learning needs but also help them influence society and emotions through their design works, further enhancing their motivation and learning outcomes.

In addition, teachers can design projects that encourage students to explore visual design autonomously and develop their ability to express personal design ideas. For instance, teachers could assign a design challenge, encouraging students to choose a design direction and create using elements like text, graphics, and color, thereby enhancing their independence and critical thinking in visual design.

2. Teachers reflect on their teaching behavior and acknowledge students' conflicts: In university-level visual design courses, teachers should regularly reflect on their teaching behavior. Especially when applying SDT, educators should acknowledge and address the cognitive conflicts that students may face in their learning. SDT emphasizes that through positive feedback and encouragement, students' learning motivation and self-confidence can be significantly enhanced. Therefore, teachers can stratify the class based on students' cognitive development, dividing them into different levels and assigning relevant tasks and challenges accordingly.

For instance, for struggling students, teachers can design foundational tasks to help them grasp the core concepts of visual communication design, such as color theory, composition principles, and visual language. For students at an intermediate level, teachers can guide them to become proficient in various design tools and software, such as Adobe Illustrator and Photoshop, to improve their practical abilities in design projects. For advanced students, more challenging design projects could be provided, encouraging them to incorporate considerations of user experience and marketing strategies into their designs, further expanding their design thinking.

This stratified approach ensures that students at different levels are motivated, reduces the learning gap between students, and improves overall teaching effectiveness. As part of reflecting on their teaching behavior, teachers can modularize course content, such as introducing sections on visual communication design principles, color theory and application, composition, and layout design. By progressively accumulating knowledge and skills, students can maintain learning progress that matches their ability levels and gain a sense of achievement as they improve.

3. Teachers design teaching strategies and provide students with multiple choices: SDT emphasizes autonomy and choice in learning. To help students gain more initiative and self-management skills during their studies, teachers can incorporate diverse options into the course design. For example, in certain modules of the visual design course, teachers can design open-ended projects, allowing students to select specific design fields to explore based on their personal interests. This type of teaching design not only respects students' individualized needs but also effectively enhances their motivation and engagement.

In this process, teachers can guide students to practice design tasks and then identify mistakes by comparing their designs with exemplary works. This comparison can create cognitive conflict, helping students realize their shortcomings and stimulating them to learn new design concepts, techniques, and styles from multiple perspectives.

Moreover, teachers can combine self-directed learning, group collaboration, and situational teaching methods to allow students to continuously practice fundamental design principles. By mastering techniques related to color theory, composition, typography, and familiarizing themselves with various design software and tools, students can create works that are forward-thinking and aligned with current industry standards.

Through such strategies, visual design educators can create more opportunities for students to increase their learning drive. For example, organizing design competitions, exhibitions, and professional training allows students to learn from and collaborate with other designers, deepening their design knowledge and improving their skills. Such practical activities not only enhance students' design capabilities but also cultivate critical thinking and interdisciplinary knowledge, preparing them for future careers in design.

The strategies for improving teaching methods in visual design education under the perspective of SDT emphasize enhancing students' intrinsic motivation, respecting their autonomy, and meeting their individual learning needs through personalized teaching design. By employing these strategies, teachers can effectively improve students' learning motivation and foster the development of their comprehensive abilities in visual design.

Insufficient Relevance and Interaction in Visual Design Courses

In the current visual design courses in colleges and universities, students' learning motivation is often affected by many factors, among which there are some problems that hinder the stimulation of students' intrinsic motivation and the improvement of learning effects.

First, the course design does not match the students' autonomy needs. Many colleges and universities' visual design courses adopt a relatively fixed and standardized teaching model. The course content and learning objectives are uniformly set by teachers, and students lack room for choice. This method ignores the students' autonomy needs in the learning process, resulting in students being unable to personalize their learning according to their personal interests and abilities, thereby reducing their learning enthusiasm. From the perspective of Self-Determination Theory, if students can have more autonomy in the course, such as being able to choose the design direction, project theme, etc., it will help improve their learning motivation and initiative.

Secondly, the teaching method focuses too much on results and ignores the process. When evaluating students' works, many visual design courses often pay more attention to the final presentation of the works, while ignoring the students' thinking and efforts in the design process. This evaluation method that relies too much on results can easily lead students to have short-term external motivations, such as completing homework quickly in order to get high scores, rather than focusing on how to improve their abilities through design. In this situation, students' sense of competence is not fully satisfied, and they cannot feel the sense of achievement brought by solving problems and coping with challenges.

In addition, students' need for relevance is not effectively met. In design learning, the interaction between students and between students and teachers has an important impact on learning outcomes. However, some colleges and universities' visual design courses ignore this point, students lack opportunities for teamwork and communication, and the interaction between teachers and students is relatively limited. This isolated learning environment makes students feel lonely and lacks support, which weakens their motivation to learn.

Discussion

In view of the above problems, the teaching methods of visual design courses in colleges and universities can be improved from the following aspects to better stimulate students' intrinsic motivation and improve their learning effects.

Increase Students' Right to Choose

Self-Determination Theory believes that autonomy is an important source of intrinsic motivation. Therefore, students should be provided with more space for autonomous choice in course design. For example, teachers can design open course projects to allow students to choose design directions or topics according to their personal interests. Students can choose to focus on different fields such as advertising design, brand image design, and packaging design, so as to conduct in-depth learning according to their interests and career plans. In addition, teachers can also encourage students to put forward their own design ideas and plans during the learning process, giving them more creative freedom. Such teaching design can not only meet students' autonomy needs, but also make them more engaged in learning.

Pay Attention to Process Evaluation and Enhance the Sense of Ability

In visual design teaching, teachers should not only pay attention to the final results of students' works, but also pay attention to the improvement of thinking and skills in the design process. Teachers can evaluate students' learning progress in stages, pay attention to how they solve problems in design, how to apply the skills they have learned, and give constructive feedback. For example, students can be asked to show their design process and creative ideas through design work logs or mid-term reviews to help them gradually improve their design capabilities. In this process, students can feel that they are constantly improving and gain a sense of accomplishment by coping with challenges, which helps to enhance their sense of ability and further stimulate intrinsic motivation.

Enhance Teamwork and Interaction to Meet the Need for Relevance

In order to meet students' need for relevance, visual design courses should increase opportunities for interaction between students and between students and teachers. For example, teachers can encourage students to work in teams through group projects or design competitions, so that they can learn and support each other in cooperation. Teamwork can not only improve students' communication and cooperation skills, but also allow them to gain a sense of belonging and support through interaction with others. In addition, teachers should also increase interaction with students through individual tutoring, classroom discussions, etc., and provide them with feedback and suggestions in a timely manner. Such interaction can help students establish good social connections and enhance their learning motivation and sense of participation.

Provide Diverse Learning Resources and Practical Opportunities

Visual design is a very practical subject, so teachers should provide students with rich practical opportunities and learning resources. In addition to classroom teaching, teachers can organize students to visit design exhibitions, participate in design workshops, and participate in actual projects to help students combine theoretical knowledge with practical applications. In addition, by inviting professionals in the design industry to give lectures or guidance, students can understand the latest trends and practices in the design industry. These practical activities can not only broaden students' horizons, but also help them exercise their problem-solving skills in real design situations and enhance their learning motivation.

Conclusion

In summary, when exploring methods to optimize visual design teaching from the perspective of Self-Determination Theory in the new phase of educational development, visual design teachers should not only actively shift away from rigid teaching concepts but also pay attention to motivation issues in visual design education. By focusing on key areas of teaching optimization and employing effective methods, teachers can continuously enhance students' enthusiasm and learning motivation. This, in turn, helps students complete learning tasks efficiently in a positive and healthy state of mind, ultimately improving the quality of learning.

Additionally, in this new phase of educational development, visual design teachers can leverage the fact that visual communication design is an art form that requires constant learning and improvement. In addressing motivational issues, teachers can enrich practice-based teaching activities by integrating theory with practice. By guiding students to observe and analyze excellent design works, study fundamental design principles and techniques, and keep up with industry trends and technological advancements, teachers can lead students to think systematically. This approach not only raises students' overall learning levels but also internalizes the motivation for classroom teaching reform, transforming the deep-rooted teaching concepts beneath the surface.

From the perspective of Self-Determination Theory, the main issues in university visual design courses lie in the unmet needs for autonomy, competence, and relatedness among students. By providing students with more autonomy, focusing on enhancing competence through the design process, strengthening teamwork and teacher-student interaction, and offering rich practice opportunities, teachers can effectively stimulate students' intrinsic motivation. This will improve their learning enthusiasm and design abilities. These strategies help enhance the teaching effectiveness of visual design courses, allowing students to gain more satisfaction and a sense of achievement during their learning process, thus laying a solid foundation for their future career development.

References

- Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviors predicting students' engagement in schoolwork. *British Journal of Educational Psychology*, 72(2), 261-278.
- Chirkov, V. I., & Ryan, R. M. (2001). Parent and teacher autonomy support in Russian and U.S. adolescents: Common effects on well-being and academic motivation. *Journal of Cross-Cultural Psychology*, 32(5), 618-635.
- Cho, A. H. (2021). Visual design literacy: Exploring the power of design in education through the lens of art history. *Journal of Aesthetic Education*, 55(3), 89-103.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.
- Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*, 26(3-4), 325-346.
- De Naeghel, J., Van Keer, H., Vansteenkiste, M., & Rosseel, Y. (2012). The relation between elementary students' recreational and academic reading motivation, reading frequency, engagement, and comprehension: A self-determination theory perspective. *Journal of Educational Psychology*, 104(4), 1006-1021.
- Dewey, J. (1980). *Art as experience*. New York: Perigee Books.
- Greer, W. D. (1984). Discipline-based art education: Approaching art as a subject of study. *Studies in Art Education*, 25(4), 212-218.
- Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology*, 52(5), 890-898.
- Guay, F., Ratelle, C. F., & Chantal, J. (2008). Optimal learning in optimal contexts: The role of self-determination in education. *Educational Psychology*, 43(4), 312-321.
- Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology*, 102(3), 588-600.

- Lemos, M. S., & Rothes, A. (2022). Motivation in higher education: The impact of self-determination theory on academic performance. *Educational Psychology Review*, 12(2), 156-175.
- Lilechi, V. W., & Ndunda, H. K. (2022). Enhancing Afrikan visual design learning through virtual reality. *Africa Design Review Journal*, 1(3), 70-83.
- Lin, C., Shipton, H., Teng, W., Kitt, A., & Do, H. (2022). Sparking creativity using extrinsic rewards: A self-determination theory perspective. *Human Resource Management*, 61(6), 723-735.
- Liu, Q., Chen, H., & Crabbe, M. J. C. (2021). Interactive study of multimedia and virtual technology in art education. *International Journal of Emerging Technologies in Learning*, 16(1), 80-93.
- Marks, B., & Thomas, J. (2021). Adoption of virtual reality technology in higher education: An evaluation of five teaching semesters in a purpose-designed laboratory. *Education and Information Technologies*, 27(1), 1287-1305.
- Mohamed, T., & Sicklinger, A. (2022). An integrated curriculum of virtual/augmented reality for multiple design students. *Education and Information Technologies*, 27(8), 11137-11159.
- Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133-144.
- Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2010). Self-determination theory and the relation of autonomy to self-regulatory processes and personality development. In *Handbook of personality and self-regulation* (pp. 169-191). Hoboken: John Wiley & Sons.
- Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci and R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183-203). Rochester: University of Rochester Press.
- Reeve, J., & Jang, H. (2006). What teachers say and do to support students' autonomy during a learning activity: The motivating role of autonomy supportive instructional behaviors. *Journal of Educational Psychology*, 98(1), 209-218.
- Rothes, A., Lemos, M. S., & Gonçalves, T. (2022). The influence of students' self-determination and personal achievement goals in learning and engagement: A mediation model. *Educational Sciences*, 12(6), 369.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78.
- Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *Journal of Educational Psychology*, 97(3), 478-488.
- Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist*, 41(1), 19-31.
- Vallerand, R. J., Pelletier, L. G., Blais, M. R., & Brière, N. M. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement*, 52(4), 1003-1017.
- Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology*, 70(4), 767-779.