ISSN 2522-6398 Vol. 4, Issue 3: 52-56, DOI: 10.25236/FER.2021.040311

The Practice of Moral Integration Teaching in Specialty Courses "Corrosion and Protection of Materials"

Guodong Xia[1, a,*], Shushan Yao[1, b,*], Haifeng Zhou[1, c], Sumei Wang[2, d]

[1]Department of Material Science and Engineering, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250353, China
[2]Key Laboratory for Liquid-Solid Structural Evolution and Processing of Materials (Ministry of Education), Shandong University, Jinan 250061, China
[a]xia@qlu.edu.cn, [b]shushanyao@163.com, [c]zhf1212@126.com, [d]wangsumei3000@sdu.edu.cn
**Corresponding Author*

Abstract: *Higher education is becoming critical for the quality of young talents. However, at present, higher education still focuses on imparting knowledge while ignores moral education. With the increasing importance of quality education, integrating moral education into specialty teaching has become an issue in specialty teaching. Taking the specialty course "Corrosion and Protection of Materials" as an example, this paper discusses how to better integrate moral education elements in the specialty courses of materials/chemistry/engineering, strengthen ideological and political education, comprehensively improve students' knowledge and moral education quality, and achieve the goal of collaborative education. Teachers can effectively integrate moral education elements and intersperse moral education cases in the teaching plan design of knowledge points, which is expected to guide students to establish self-awareness, including patriotism and protection of the natural environment and resources.*

Keywords: *Moral Integration Teaching, Ideological Classroom, Specialty Courses, Ideological and Political Education.*

1. Introduction

School education focuses on imparting knowledge and skills while neglects moral education. For a long time, school education has neglected students' psychological and physical health, resulting in many students with high IQ while low EQ. What is more, students' suicide has repeatedly occurred in recent years. Although counselors and class teachers have carried out ideological education many times, suicide-like phenomena still occur occasionally.

In recent years, the Ministry of Education has put forward "teaching and educating people", emphasizing "educating people". School education should focus on students' all-round development in moral, intellectual, physical and mental health. "Ideological Education" was proposed and advocated by the Qilu University of Technology in 2015. Many specialty courses have revised their teaching plans, incorporated moral and tolerance factors into knowledge points, and strengthened ideological and political education [1-2].

In recent years, Qilu University of Technology has implemented the reform of "the moral and intellectual credit system" to train talents and achieved good results. This paper innovatively explores the design of "the Moral Integration Classroom", the double credit system and the moral education credits. Among them, the ideological class has achieved good results in specialty courses. Teachers refine the teaching elements in the curriculum and integrate moral education into classroom teaching organically so that students receive the baptism of moral education while learning scientific and cultural knowledge. Moreover, moral education comes from the reality of life and would help students understand and digest some boring theoretical knowledge. Therefore, Ideological classroom" not only does not affect but also promotes the study of the curriculum [3-5].

"It takes a teacher to transmit wisdom, impart knowledge and solve doubts!" It could be boring for students to simply learn specialty courses, especially many specialty theories. An ideological classroom

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provides a good platform and opportunity for teachers to exercise. By preparing a good teaching plan for moral education, we fully realize that moral education can be completely compatible with and even promote specialty course teaching. By being compatible with moral teaching, we find that the boring specialty courses can also become vivid and colorful because moral education is closer to students and more closely related. As long as we organically combine specialty courses with moral education, we will better promote specialty course education.

Material corrosion and protection is a multidisciplinary compatible course, which has related contents in high school chemistry. In a specialty course of materials, chemistry, aviation, engineering, by studying various physical, chemical and electrochemical reactions of materials in environmental media, on the surface or interface, we could explore the general and special laws of their damage to material organization and structure. We put forward the measures to control or prevent corrosion of materials or their components under various conditions, which is particularly important for production and engineering applications [6]. The author combed the course of material corrosion and protection carefully, and found that there are many moral education contents, which should be integrated into the course teaching. The design of "Ideological Classroom" will be briefly introduced by taking "Corrosion and Protection of Materials" as an example.

2. Moral education elements are integrated into knowledge points

Table 1 shows some design example of "Ideological Classroom" in the course of "Corrosion and Protection of Materials".

The introduction part mainly talks about the concept, classification and evaluation of material corrosion and the significance of corrosion protection. "Ideological Classroom" can stimulate students' enthusiasm for studying this major and cultivate students' good character of diligence and thrift through corrosion cases in life. In class, we introduce some examples of material corrosion in daily life. The most common one is iron rusting. Every year, the lost steel by corrosions is equivalent to the annual output of a large steel mill. Also, some safety accidents caused by corrosion resulted in casualties. Therefore, corrosion protection is of great significance. Through these examples in our life and around us, we can arouse students' enthusiasm for studying this major, pay attention to the protection and sustainable utilisation of materials, cultivate students' good moral character of diligence and thrift, and lay a foundation for students to set up good conduct in future jobs.

The chapter on "electrochemical corrosion thermodynamics" mainly deals with the thermodynamic criterion of material corrosion, potential-PH diagram and its application. "Moral integration classroom" can lead to corruption, guide students to take the right path and be good people, and establish the idea of serving our country. Corruption and corrosion are closely related. Corruption leads to crime, which guides students to take the right path and be good people. Corruption is a hot spot in current society, mainly because money and beautiful women corrupted officials. Corruption has seriously endangered our country. Many officials were very good at first, but were corrupted by temptations. As our young students, we will also have the opportunity to be officials in the future. It is critical to "get out of the mud without being corrupted" and "have the right without being corroded". We should maintain noble morality and correct world outlook for a long time, and establish the idea of serving our country, so that we will not be corroded by fame and fortune.

The chapter on "local corrosion" mainly describes the concept and mechanism of local corrosion including galvanic and pitting corrosions. Through the universality and harmfulness of local corrosions, "Moral Integration Classroom" could warn students to resist evil thoughts or habits as early as possible. Through the universality and harmfulness of local corrosion, students should pay more attention to trivial problems that are not easy to find. It is especially true in terms of ideology and morality. If we could not resist bad words and deeds, they will gradually spread like pitting or crevice corrosion over time, resulting in problems. For example, some of our young students are obsessed with games or mobile phones. It seems to be a trivial matter. If you do not pay attention, will it have more and more influence? Some students play games all night, and some students play on mobile phones in class. Does this affect their studies and future work? Everyone should remember the sentence "Do not do evil things though they may be insignificant. Do not give up good things though they may be minor matters".

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Table 1: Design examples of "Ideological Classroom" in the course of "Corrosion and Protection of Materials".

chapters	Main contents	Moral education elements
Introduction	The concept, classification and evaluation of material corrosion, the significance of corrosion protection.	Through corrosion cases in life, we could stimulate students' enthusiasm for studying this major, and cultivate students' good character of diligence and thrift.
Thermodynamic Criterion of Corrosion	Thermodynamic Material Corrosion, Potential-PH Diagram and its Application	Corrosion leads to corruption, which leads students to take the right path and be good people, and sets up the idea of serving our country. Corrosion and corruption are closely related.
Local corrosion	The concept and mechanism of local corrosion including pitting and galvanic corrosions	Through the universality and harmfulness of local corrosion, we warn students to resist evil thoughts or habits as soon as possible, we tell students should pay more attention to trivial problems and problems that are not easy to find.
Corrosion in Natural Environment	The concepts and mechanisms of atmospheric corrosion, soil corrosion and marine corrosion	Through the introduction of scientists' devotion, we tell students to enhance their' learning motivation and inspire students to establish the good moral character of being brave in contributing to our country.
The protection methods for materials corrosion	The main methods of corrosion protection of materials, the concepts and mechanisms of cathodic protection and anodic protection	By protecting examples of corrosion damage, we guide students to put good moral character into good actions and develop good habits of saving resources and protecting the environment.

The chapter on "corrosions in the natural environment" mainly describes the concepts and mechanisms of atmospheric corrosion, soil corrosion and marine corrosion. The "Moral Integration Classroom" can enhance students' learning motivation by introducing scientists' contributions and stimulate students to establish the good moral character of being brave in contributing to our country. We could introduce several scientists' contributions to environmental corrosion, enhances students' learning motivation, and establishes correct life values. For example, Professor Li Xiaogang at the University of Science and Technology Beijing, who has devoted himself to the research field of corrosion for a long time, has achieved a series of first-class basic research and engineering application results on natural environment corrosion such as atmosphere, soil and seawater, and built the most perfect natural environment corrosion research platform. In 2015, Li Xiaogang's team published a paper on the environmental corrosion platform of materials in the top international journal Nature, which marked a new step in the research field. Through typical examples, students are encouraged to establish the good moral character of courage to contribute to the development of our country.

The chapter on "the corrosion protection of materials" mainly introduces the main protection corrosion methods s, such as the concepts and mechanisms of cathodic protection and anodic protection. The "Moral Integration Classroom" can guide students to put good moral character into good actions and develop good habits of saving resources and protecting the environment through examples of protecting corrosion and destruction. It is everyone's responsibility to save resources and protect the environment. Corrosions happen around us. Through the explanation of corrosion protection, tell students that corrosion damage can be effectively alleviated or resisted from different aspects. There are examples of protecting against corrosion damage everywhere in life. For the simplest example, the chains of bicycles we ride often rust easily. Do we need to take measures in advance to prevent rusting damage? Such simple protection not only brings convenience to ourselves but also saves resources and protects the environment. Kill three birds with one stone. Why not do it; one would be only too glad to do it. Therefore, we should put good moral character into good actions, start from the small things around us, and prevent corrosion, contributing to our country.

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3. Moral education cases guide knowledge transfer

There are many cases of material corrosion and protection. Especially, China has a 5,000-year-old civilization, has a long history and leads the world in terms of scientific and technological level as early as two or three thousand years ago. For example, ancient bronzes are now so amazing for us. Many cultural relics have a high technical level. Here, we can give students the story of Jian Gou. Jian Gou, the king of Yue country, is well known, and the story of "serving one's life" has been passed down through the ages. The story of Jian Gou, the king of Yue country, inspired many people to work hard and strive for strength in the face of difficulties. Students can experience a deep love for our country and the spirit of fighting for our country.

Here, we can show the pictures of Jian Gou's Sword of King of Yue to the students, tell the story of Jian Gou's Sword of King of Yue, let the students feel the wisdom and intelligence of Chinese people thousands of years ago, and stimulate their patriotism and love for science and technology.

Jian Gou's sword was unearthed in Tomb No.1 Wangshan, Jiangling, Hubei Province in 1965. As shown in Figure 1, Jian Gou's Sword is 55.7 cm long. When it was unearthed, it was cold, and the blade was still sharp. The sword body has black diamond patterns with exquisite ornamentation, and the thinnest part of engravings is only 0.1mm. Near the sword lattice, there are two lines of bird seal inscriptions: the King of Yue's dove shallow (Jian Gou) used the sword at first glance. The hilt and lattice of the sword are black, and patterns are cast on both sides of the lattice, which are embedded with blue glass and turquoise, respectively. The sword head is turned outward into a hoop shape. The sword inside has 11 concentric circles with a width of less than 1 mm. Jian Gou's sword made by the King of Yue country is exquisite, showing the superb skill of the sword caster, which can be called China's national treasure.

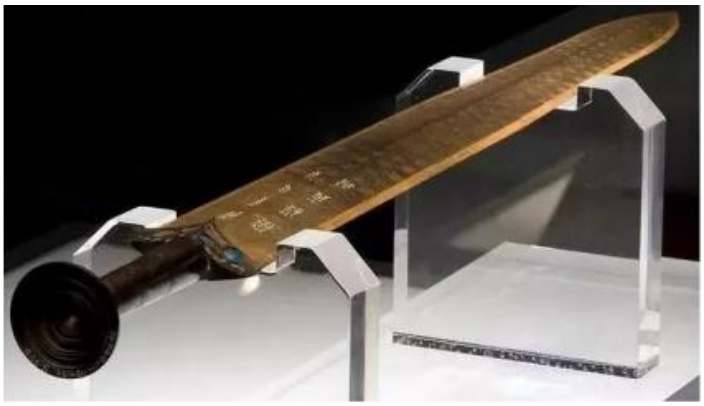

Figure 1: Jian Gou's Sword of The King of Yue.

The black diamond plaid and black sword lattice on Jian Gou's sword are vulcanised; sulfur or sulfur compounds interact with the surface of metals to form a thin protective film (vulcanised layer), which also contains other elements. This treatment method not only makes the sword beautiful but also enhances the anti-corrosion performance. In the period of Qin Shihuang, the surface treatment technology of swords was improved. Chromium salt oxidation method with the anti-corrosion ability was adopted. The chromium salt was used as the oxidant to form a superior dense oxide film on the surface of swords, which made it no longer play other chemical roles. This method has been used only in recent decades abroad. Both the sulfide layer and the oxide layer are extremely thin, one-hundredth of a millimetre, which is about one-tenth of the thickness of a newspaper. With this thin protective layer, Jian Gou's sword has been buried in cold and humid soils for more than 2,000 years. It is still shining and sharp, which is a great achievement in ancient Chinese science and technology.

4. Conclusion

Today's students are the pillars of our country tomorrow. Our teachers must infiltrate moral education in classroom teaching and enhance students' moral quality. If students realize the importance of environmental protection from the bottom of their hearts, they will consciously reduce pollution to the environment. If students realize that the energy crisis is coming, they will reduce waste and cherish the current energy.

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Moral education can not be quick but needs long-term accumulation and subtle influence. Teachers should adhere to the elements of morality and tolerance in lectures for a long time, and strengthen students' ideological and political education to achieve the best unity of teaching and educating people and make students develop in an all-round and healthy way.

The content of moral education is rich and varied, and the ways of education are flexible and changeable. Adding moral elements to specialty courses will also increase interest and stimulate students' interest. As long as teachers give moral education to students by taking advantage of the situation in the teaching of specialty courses, they will become high-quality talents with both specialty knowledge and noble moral character.

Acknowledgment

This work is supported by the Teaching and Research Project on "Ideological and Political Special Item" of Qilu University of Technology (No. 2020szzx04), and partly supported by the Natural Science Foundation of Shandong Province (No. ZR2020MF104).

References

[1] A. Ge and Y. Zhang (2017). Practice and Thinking of Promoting Moral Education" by "Moral Integration Classroom". Journal of Higher Education, vol.3, no.22, p.27-29.
[2] H. Li and Y. Liu (2019). Ideological's classroom is silent——Exploration and practice of ideological and political work in Qilu University of Technology (Shandong Academy of Sciences). Shandong Education (Higher Education), vol.5, no.11, p.29-30.
[3] X. Hei, J. Liu, D. Xing and X. Tan (2020). There is no trace of the integration of preaching and teaching——"Organic Chemistry" Ideological classroom teaching design and comprehension. Journal of Higher Education, vol.3, no.17, p.48-50.
[4] X. Dai, H. Zhao, T. Chen and Y. Tian (2020). Construction and Practice of Moral Integration Classroom in Physical Chemistry. Journal of Higher Education, vol.6, no.20, p.90-92.
[5] F. Ma, S. Xu and F. Min (2020). "Moral integration classroom"-realizing the dual development of teaching and educating people. Journal of higher education, vol.6, no.8, p.166-167.
[6] Z. Tian and W. Liu (2020). The application of micro-course in the construction of course resource database for the corrosion and protection of aerial materials. Paper Equipment and Materials, vol.49, no.4, p.191-192.