Exploration and Practice of Ideological and Political Teaching in Professional Curriculum

Taking the Course of Data Analysis Using Python as an Example

Xiaohui Guan(✉) and Zhimin Zhou

College of Information Engineering, Zhejiang University of Water Resources and Electric Power, Hangzhou, China

{guanxh,zhouzm}@zjweu.edu.cn

Abstract. Integrating the ideological and political teaching into all courses is an important direction of education reform in colleges and universities. This paper explores a specific implementation mode how to conduct the ideological and political education in every link and aspect by optimizing course content, designing teaching process, refining ideological and political elements. "A line, a ring" path is built to impart knowledge, promote ability and guide moral values of students throughout the whole process of teaching of *Data Analysis Using Python*. It is demonstrated that the teaching mode is feasible and effective by several teaching practice. The students have achieved comprehensive development by ideological and political teaching.

Keywords: ideological and political teaching · fostering virtue through education · teaching case · data analysis using python

1 Introduction

Comprehensively promoting the ideological and political theories of students is a fundamental task of fostering virtues through education, which was pointed out in the report of the 19th National Congress of the Communist Party of China. It is also an effective means of improving the quality of personnel training of students [2]. Especially, President Xi addressed those foster virtues of students should be regarded as the core work of developing students' good qualities at the National Conference on Ideological and Political Work in Colleges and Universities [6]. In order to implement the instruments of "Guiding Outline of Ideological and Political Construction of College Curriculum", issued by the Ministry of Education, and the "Implementation Plan of Ideological and Political Construction of College Curriculum", issued by the Provincial Department of Education, we should permeate the ideological and political theories into the whole process and all corners of teaching in each professional course to guide students to establish a correct outlook on values, life and time [1]. So as, the professional courses and ideological-political courses play interdependent roles to impart knowledge and foster virtues for students simultaneously. However, in the past, the professional courses, focusing on the

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cultivation of intelligence and ability, and the ideological-political courses, focusing on moral education, can't form join forces in developing a perfect student. Therefore, we support students should be actively guided to worry about the development of science and technology of China [4]. They should set up a life goal in the light of our country's fate. This paper explores an executable way to implement virtue education in teaching of professional course in the Internet of Things Project.

2 Course Analysis

The technology of Internet of Things (IoT) refers to embedding all kinds of sensors into everything and realizing the conversation between people and things with the help of wireless network technology [7]. It integrates computer network, electronic technology, communication engineering, automation technology, embedded technology, etc. With the rapid development of big data and artificial intelligence, IoT technology has changed from simple node control to focusing on intelligent analysis and prediction. That is, massive data generated by IoT will be processed and analysed to form advanced intelligent applications, which is the core value of IoT. Therefore, the educational objectives of IoT major are cultivating high-end talents who can make analysis with big data in the future. In order to meet this demand, we offer the course *Data Analysis Using Python*, which aims to cultivate students' ability to analyse and process the big data of IoT using Python. At the same time, the humanistic, legal, ethical and social issues should be discussed in classroom in addition to knowledge and skills. To inspire students' emotion, touch their soul, stimulate their thinking, we should introduce persuasive story and utilize some unusual teaching strategies, tools and models to make the classroom lively. Consequently, the correct opinions about world, value and life are established unconsciously for students.

3 Designing the Ideological and Political Teaching

3.1 Overall Design Basing on Moral Education

A comprehensive course design includes formulating teaching syllabus, making teaching plan, arranging teaching content, implementing teaching process, conducting assessment and feedback, which composes a teaching line. We should implant the moral education in each link of above line, which can result in the synchronization of professional ability and moral cultivation. The illustration is shown in Fig. 1.

On the general requirements of ideological and political teaching, the professional quality and moral values education should be integrated into professional knowledge and ability in teaching process [5]. In the course of *Data Analysis Using Python*, we build an all-round ring, which indicates comprehensive quality requirements including mastering data analysis methods, developing data analysis and processing skills, cultivating responsibility, teamwork, adventurousness, cherish life, self-awareness, living habits, time management and so on. The illustration is shown in Fig. 2.

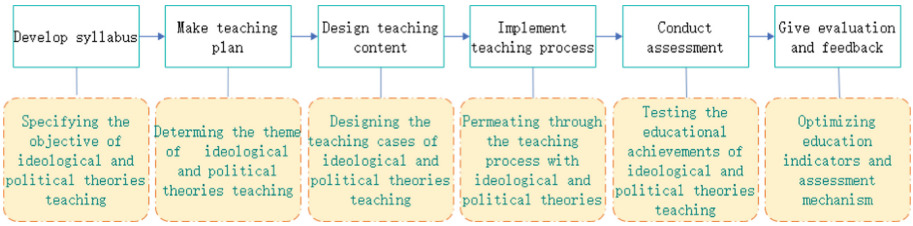


Fig. 1. The teaching line of ideological and political teaching

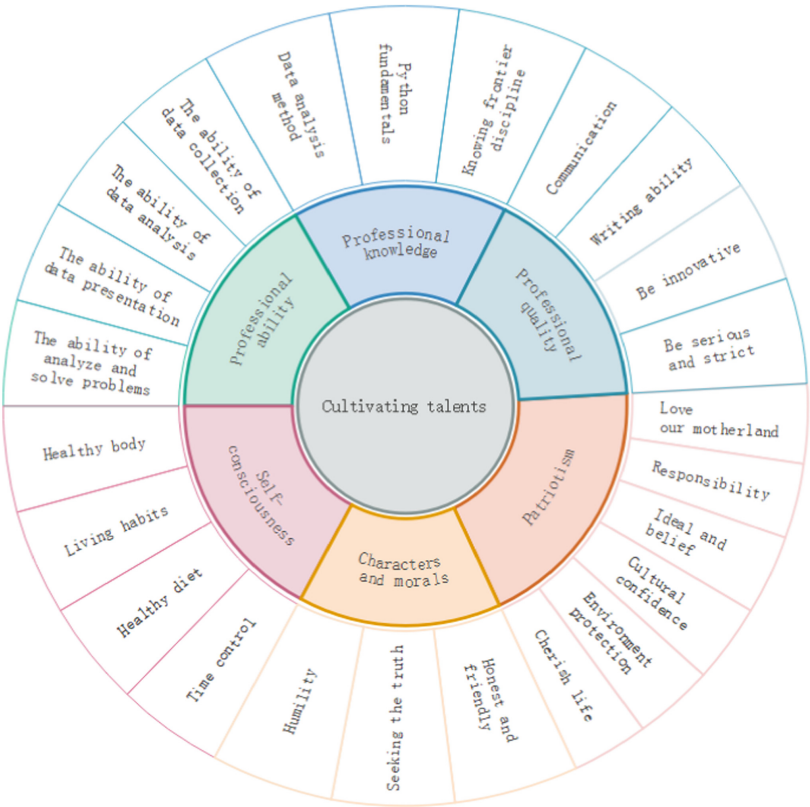


Fig. 2. The all-round ring of ideological and political teaching

3.2 Integrate the Ideological and Political Theories into Course

After learning a course, students should achieve three objectives: professional knowledge and ability, professional quality, ideology and morality [3]. Specifically, the requirements of *Data Analysis Using Python* are as followings:

To understand the latest technology and frontier research;
To cultivate collaboration and innovation professional quality;

Table 1. The teaching projects and their objectives of ideological and political theories.

	Chapters	Teaching Projects	Teaching Content	The Objectives of Ideological and Political Teaching
1	Introduction to course	/	The status, objectives and content, teaching methods, assessment plans and prospects of course.	Cultivating students' patriotism, national confidence and innovation consciousness. Enhancing their self-confidence and happiness.
2	Python fundamentals	/	Programming grammar, data type, operations, functions and modules	Cultivating students' responsibility and mission to explore the unknown. Guiding them to stand on solid ground and pursue truth.
3	Data crawling	Crawling Top 250 movie Information	Regular expressions, RE module, URLlib module, Requests module and BeautifulSoup module	Teaching students to abide by the law, abide by professional ethics, and form a bottom-line thinking. Guiding them to establish the idea of persistence.
4	Data pre-processing	COVID-19 data analysis and mining	Data cleaning, data transformation, NumPy module and Pandas module	Cultivating students' awareness of data and information protection. Introducing life education to cherish the life and be grateful. Developing good life style and health habits.
5	Data exploration	Job information analysis and processing	Statistical indicators analysis and correlation analysis, NumPy module and Pandas module	Guiding students to have a correct self-cognition. Encouraging them to build up the confidence of success and set lofty life goals.

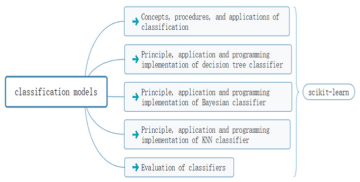
(*continued*)

Table 1. (*continued*)

	Chapters	Teaching Projects	Teaching Content	The Objectives of Ideological and Political Teaching
6	Classification models	Iris data set analysis	Decision tree classifier, Bayesian classifier, KNN classifier, and Sklearn module	Cultivating students with craftsman spirit and preciseness. Suggesting them to abide by the rules and stick to the bottom line of being a man and doing things.
7	Regression analysis	Boston housing price analysis	Linear regression, logistic regression and Sklearn module	Improving students' professional ability and quality. Training them to be practical and realistic and speak with data.
8	Clustering analysis	Airline customer relationship analysis	K-means clustering, DBSCAN clustering, Mean Shift clustering and Sklearn module	Asking students to have a right attitude towards prosperity and adversity. Guiding them to shape the correct outlook on values, life and time.
9	Data visualization	Achievement data analysis and visualization	Data visualization types, matplotlib module, seaborn module	Improving students' professional quality to strengthen competence Teaching them to be good at self-presentation.

To develop self-recognition, self-learning and a good sense of time;
To cultivate credibility, integrity and responsibility.

So, we take project-driven teaching method to achieve the goals of course. That is, we permeate the idea of good morality into each project. Table 1 shows all projects and their goals achieved. Figure 3 shows an example of how to overlap the ideological and political theories on teaching content.

Chapters	Chapter 6 Classification Models
Section 1 Analysis of Teaching	
Teaching Objectives and requirements	**Knowledge Objectives:** Understanding the concept and application of classification, mastering the common algorithms such as: decision tree classifier, Bayesian classifier, KNN classifier, support vector machine, etc., and understandings the evaluation of each classifier algorithm. **Ability Objectives:** Being able to use SKlearn module to program classification algorithms, being able to classify specified data sets, and make an objective evaluation. Being able to seek ways to find and solve problems in learning. **Quality Objectives:** improving the professional ability and quality, learning how to be a man and to do things. **Teaching requirements:** Making students master the methods, ideas and skills of data classification through theoretical explanation and case analysis.
Teaching Content	
Teaching Difficulties and Key Points	**Key points:** The principles and steps of classifier algorithms **Difficulties:** how to select an appropriate algorithm in particular applications
Teaching duration	8 class hours
Teaching Methods	**Before class:** Preview with learning materials pushed by *Super Star CAI*. **In class:** Use a variety of teaching strategies, such as lecturing, heuristic, sharing, discussion, argument, to improve students' concentration and interest. Meanwhile, the ideological and political theories are integrated into professional knowledge and ability in teaching process. **After class:** Finishing assignments, which should be submitted by CAI.
Teaching Means	Oral instruction, supplemented by case analysis and discussion Remote instruction aided by *Super Star CAI*

(a)

Section 2 Design of Teaching Process

1. Review of last class

Calculating the statistical indicators of data, understanding the distribution and characteristics of data, gaining insight into the hidden laws behind data.

2. Introduction to this class

Classification is a very important analysis method in data mining. It is the most basic and effective activity of human in exploring the world. Classification has widely used in credit risk assessment, medical diagnosis, marketing, spam analysis, crowd classification, news classification, query classification, commodity classification, web classification and so on.

3. Lecture of this class

1) The Concept of classification
Definition of classification
Application of classification
Classification Steps
Common classification algorithms

Morality Education: Telling students the idea and method of solving a difficult problem--- policies of divide and rule: Dividing a big problem that is difficult to solve directly into smaller, identical problems so that they can be broken down separately.

2) Decision tree classifier
Definition of decision tree
The construction process of decision tree
Decision tree algorithm: ID3, C4.5
Python implementation of decision tree algorithm
3) Naive Bayes Classifier
The principle of the algorithm
Algorithm steps
The advantages and disadvantages of the algorithm
Python implementation of the algorithm
4) K Nearest Neighbor Classifier
The principle of the algorithm
Algorithm steps
The advantages and disadvantages of the algorithm
Python implementation of the algorithm

Morality Education: Telling students the truth: if you live with a lame person you will learn to limp. If you make friends with excellent people, your thoughts and habits will be contagious, you will become more hard-working.

5) Combined classifier
The principle of the algorithm
Algorithm steps
The advantages and disadvantages of the algorithm
Python implementation of the algorithm

(b)

Morality Education: Telling students the truth: more hands produce a stronger flame. We have to be good at sharing information and collaboration in future.

6) Evaluation of classifiers
Accuracy
Precision
Recall
F1-score

4. Summary and expansion

Summary: explaining the concept and application of classifiers, common algorithms and how to programing with python, the application fields of classifiers, analyzing the data with various classifiers and comparing the classification results.

Learning suggestions: Mastering the principles and implementation steps of classification algorithms, and select appropriate classification algorithms to achieve the best result. Exploring the improvement and application of classification algorithm through consulting resources.

Extended Reading:

[1] KNN classification: https://blog.csdn.net/songguangfan/article/details/92581643

[2] Other classification algorithms: https://www.cnblogs.com/multhree/p/11264706.html

Assignment:

1. Studying the materials after class and make a report sharing with classmates in the group.
2. Using the classification algorithm to classify iris data and compare the calculation accuracy.

Section 3 Teaching Introspection

Teaching Reflection:

The principles, steps and implementation of each algorithm should be explained by learning and practicing, so that students can master the specific application of classification algorithm. The ideological and political theories should be introduced to strengthens the professional ability and quality of students, and teach them how to being a person and do things.

Thinking of improvement:

1) Deeply studying auxiliary materials, looking for cutting-edge cases, and integrating them into the class to make the class more attractive.
2) Improving the standardization of language and accuracy of expression in personal teaching.
3) Encouraging and guiding students to carry out extra-curricular extended learning and carry out research and discussion on practical problems based on the course content.

(c)

Fig. 3. An example of teaching case, which shows how to integrate the ideological and political theories into teaching content

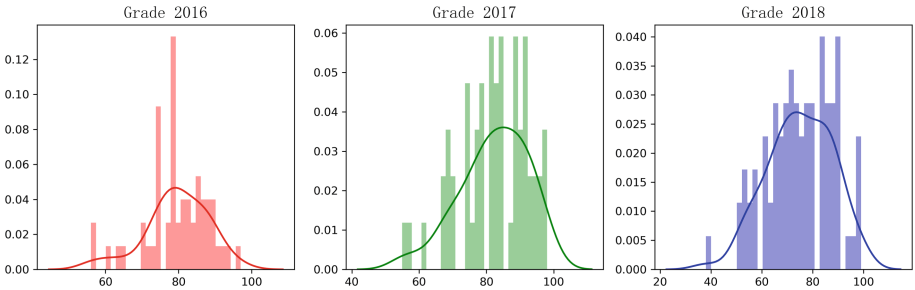


Fig. 4. The illustration of score histogram for Data Analysis Using Python in the last three year.

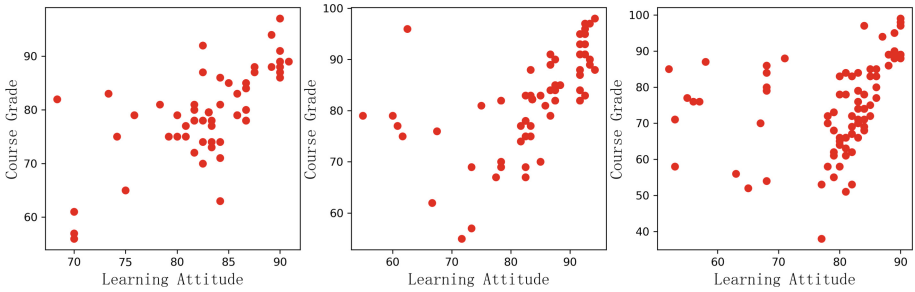


Fig. 5. The illustration of relationship of course grade and learning attitude.

4 Teaching Results and Introspection

To verify the effectiveness of teaching, we analyse the course grade for last three years. The illustration of histogram is shown in Fig. 4. As we can see, the results basically follow the normal distribution and the average score is increasing year by year.

For further analysis, we also draw a scatter diagram about the relationship of course grade and learning attitude, which is shown in Fig. 5. It represents the impact of ideological and political teaching for academic record. From this figure, we can see that the course grade has a great relationship with ideological and political level.

In general, ideological and political teaching plays an important role in cultivating talents. However, the key of good ideological and political teaching is teacher, who should not only be a good imparter of knowledge, but also a good guide for students. Unfortunately, most professional teachers usually have high professional skill, but weak ideological and political knowledge. In order to strengthen educational function, it is necessary to improve the docking ability of professional teachers in ideological and political theories on teaching, which can be carried out from the followings:

- Constantly improving the understanding of ideological and political theories and patriotism in teaching, setting up a good role model for students, and gaining respects from students with their personal charisma.
- Greatly enhancing the ideological and political education skills through studying, communication and training.

- Exploring how to mine the moral elements from knowledge and how to look for entry points of technology and mind for "dual education" classroom.
- Focusing on the extracurricular activities, such as practical courses, innovation and entrepreneurship projects, competition, etc., in addition to classroom.

5 Conclusions

The ideological and political theories are required to be integrated into professional courses in New Engineering Disciplines. It is the main task of cultivating excellent talents. This paper focuses on the top-level design of course to impart morality education into professional knowledge. It explores implementable strategies to cultivate students' positive outlook on life, values and morality and guide them to achieve desired career objective for our country.

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References

1. Feng Huifang. The Value of The Times, The Internal Requirements and the Specific Path of curriculum Ideological and political Construction: Based on the Perspective of College teachers [J]. Journal of Yunnan Agricultural University (Social Sciences), 2021, 15(02): 139-143+156.
2. Han Xian-zhou. Promoting practice and innovation of moral cultivation through curriculum ideology and politics [J]. China Higher Education, 2019(23): 12-14.
3. Lu Ling, Yang Wu, Chen Yuan, Zeng Qingsen. Data structure course education path exploration and practice [J]. Journal of computer education, 2022 (02): 30-33.
4. Wang Xiuyan. Exploration and Practice of curriculum Ideological and political Construction in Applied Undergraduate Colleges [J]. Education and Teaching Forum, 2022(02): 106-109.
5. Wei Xuechao. Exploration of Ideological and Political Elements in Vocational College English from the Perspective of "Curriculum Ideological and Political" [J]. Journal of Heilongjiang Teacher Development College, 2021, 40(03): 75-78.
6. Wu Jing, Hu Hao. At the National Conference on Ideological and Political Work in Colleges and Universities, Xi Jinping stressed that ideological and political work should run through the whole process of education and teaching to create a new situation for the development of Higher education in China [J]. China Higher Education, 2016(24): 5-7.
7. Zhang Hongwei, WANG Xinhuan, WANG Jing. Research on Ideological and Political Resources Mining and teaching Methods of embedded System Design Course [J]. Industrial and Information Education, 2021(03): 60-63.