Design and Application of Software Engineering Course Case Resource Library Based on Values Education through Curriculum

Lian Li[1*], Hongmei Li[2a]

2595369779@qq.com*, [a]23275746@qq.com

[1] School of Big Data and Artificial Intelligence, Anhui Xinhua University, Hefei, China,
[2] College of Computing and Information Technologies Philippines National University, Manila, Philippines

Abstract: In view of the immature construction of software engineering course case resource database in universities. This project presents a software engineering case library based on curriculum ideology and politics. An effective method to establish and introduce ideological and political cases in curriculum is proposed. Finally, in order to verify the performance of the proposed method, a classroom attention analysis based on facial recognition is carried out. The results show that the students' learning enthusiasm is greatly improved in the classroom where the proposed method has been introduced.

Keywords: software engineering, case library, curriculum ideology and politics, attention analysis.

1 Introduction

Software engineering courses belong to the core courses of software engineering majors. The course integrates the process, methods and tools of software development, aiming to improve the efficiency and quality of software production, and plays an important role in technical support and promotion of the development of the software industry.

In the past five years, major universities in China have set off a wave of "course ideological and political" teaching reform. Values Education through Curriculum are the ideological guidance for higher education, and also the ideological guidance for teaching and educating people in colleges and universities. Many colleges have also carried out the teaching reform of "Values Education through Curriculum" for software engineering courses [1]. For example: Pei Lijun (2022) from the Higher Vocational and Technical College of Dalian Neusoft Institute of Information has studied the cultivation and practice of craftsmanship in the ideological and political course of software engineering [2]. Duan Yanming, Xiao Huihui, Tan Qianlin (2022) and others from the School of Big Data and Computer of Hechi University tried to mine the ideological and political elements in the "Software Engineering" course. Huang Lanying [3], Li Zhimin and Zhang Tao (2021) from the School of Computer and Information Science of Hubei Institute of Technology have carried out the construction and reform of the software engineering professional course group based on "OBE + Ideological and Political" [4]. Deng Na and Lin Shan (2021) from the School of Computer Science of Hubei University of Tech-

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nology studied the teaching mode of software engineering practice courses based on "active ideology and politics" and "comprehension and practice"[5].

Taking Anhui Xinhua University as an example, the software engineering course team is also actively exploring how to integrate ideological and political elements into the software engineering course.

2 Methodology

This paper designs and applies a software engineering case library based on curriculum ideology and politics. The method includes the following processes. Clear course objectives. Design case theme. Clarify the goal of case teaching. Analyse the meaning of the background of the case. Implementation of the teaching process. Teaching assessment and evaluation.

3 Realization

Software engineering course group of Anhui Xinhua University as an example, they have designed the following course case library, as shown in Table 1. Next, take the case of the demolition and resettlement management system as an example to introduce the establishment and application process of the case library.

Table 1. The library of the case resources.

NO.	Name	Technical	Remark
1	Demolition and resettlement management system	JAVA WEB	SSH framework
2	customer relationship management system	.NET	
3	Soche.com	JAVA WEB	SSM framework
4	Online pet sales system	JAVA WEB	SpringBoot framework
5	library management system	.NET	

3.1 Clarify the course objectives

This course focuses on the most basic life cycle processes of software engineering and strives to illustrate the ideas and methods of software engineering through some concrete examples. In-depth discussion of software process, software engineering objectives and requirements, combined with software engineering environment, software project management, etc. To train students to use the basic principles of software engineering to solve practical problems and the ability of innovation, train students to become the information society and knowledge economy era of high quality, high quality applied professional software talents.

3.2 Design case theme

Case subject: "Analysis, Design and Implementation of Demolition and Resettlement Management System". The theme of this case involves the major plan for people's livelihood - demolition and resettlement, so the core value of patriotism and concern for people's livelihood and conditions are naturally integrated into the teaching content during the analysis. The

case itself and its expanded content can also promote a deeper understanding of the core value of harmony. Because college students are the masters of the country and society in the future, when introducing the background of the case, they will also list the corruption problems caused by the demolition and resettlement process such as "opaque process" to the students, and implant the values of honesty and politics into the students. Part of the data in this case involves confidentiality. Therefore, this case integrates ideology and politics to cultivate the values of contemporary college students at the personal level: patriotism, dedication, integrity, and friendliness. Based on the case background, it also helps students to have a deeper understanding of the two core socialist values of harmony and the rule of law, as well as the ideological bottom line of building a clean government.

3.3 Clarify the goal of case teaching

Through this case study, students can develop their ability to analyze and solve problems under specific policies and systems, especially the introduction of real projects in cooperation with public institutions as analysis cases, which also improves students' ability to analyze problems. A higher challenge. The process of guiding demand acquisition also cultivates students' ability of communication and expression.

In the case study, it introduces the professional qualities that a software engineer must have: abide by the rules and regulations of the country, the government and relevant institutions; Abide by the cooperation contract, abide by the industry analysis and design specifications, abide by the intellectual property protection law, etc.

Help students understand and construct the following socialist core values: "harmony, rule of law, patriotism, dedication, integrity, friendly", for students to enter the future workplace to build a "clean politics" ideological bottom line.

3.4 The implementation process of the method

3.4.1 Teaching process

Taking the requirements specification of Chapter 3 of the software engineering course as an example, the ideological and political process of introducing the course in the stamping teaching process is as follows.

Stage 1: Introduction. Introduce the theoretical knowledge points of requirements specification. Ask about the progress of the previously arranged work, that is, the understanding of the social phenomenon of demolition and resettlement.

Stage 2: Introduce the background of the case. State the user vision document given by the client. Analyse the complexity of the demolition and resettlement business in real life and the problems that may arise.

Stage 3: Display of confidential documents. State the source of the case, showing confidential documents, software copyrights, and licensing documents. Educating students to protect their own intellectual products and respect the intellectual property rights of others.

Stage 4: Group discussions and meetings. Role-playing and brainstorming.

Stage 5: Group Presentation.

Stage 6: Teachers show reference requirements specification and summarize.

3.4.2 Values Education through Curriculum

Taking the teaching process introduced in the step 1) as an example, the details of the ideological and political integration of the curriculum are as follows.

a) Integration scenario 1 - Harmony

Integrate position: Stage 1.

Inclusion content: Sum up the contradiction phenomenon in the process of demolition and resettlement management, put forward scientific management methods, promote the establishment of harmonious relationship between demolition and resettlement parties.

b) Integration scenario 2 - Clean and honest politics

Integrate position: Stage 2.

Inclusion content: Listed the policy announcement and the necessity to supervise the process of demolition and resettlement. Inculcate the ideological bottom line of "clean politics" in students.

c) Integration scenario 3 - Rule of law

Integration position: Stage 2 and 3.

Integration of content: The integration of information data is evidence-based, durable, easy to track, and avoids controversy over ambiguous information. This is a good demonstration of the rule of law.

d) Integration scenario 4 - Patriotism

Integrate position: Stage 1.

Integration content: This is a good demonstration of the rule of law, too.

e) Integration scenario 5 - Dedication

Integration position: Stage 3 and 4.

Inclusion content: In the third stage, while guiding students to respect the law, they should also respect the profession and have basic professional quality. The fourth stage guides students to take each work link seriously in discussions and meetings.

f) Integration scenario 6 - Integrity

Integration position: Stage3 and 4

Incorporation of content: In the third stage, compliance with various norms, contracts and agreements is integrity, and in the fourth stage, the feedback on all needs in the discussion and analysis should be realistic.

g) Integration scenario 7 - Friendly

The position of integration: Stage 4 and 5.

Integration content: Introduce a sense of teamwork and encourage each group to interact in an equal, friendly and harmonious manner. Instruct each group to organize the presentation in a reasonable and friendly way.

3.4.3 Teaching philosophy

People-oriented, all-round development, quality education and creativity - open teaching philosophy.

a) Pay attention to the growth and development of students.

b) Pay attention to teaching efficiency and quality education.

c) Focus on innovation - open teaching.

4 Student attention analysis

In this paper, students' attention is analyzed respectively in the classroom environment without curriculum ideology and politics and in the classroom environment with curriculum ideology and politics [6]. The main research process is Face detection based on SSH(Single Stage Headless Face Dector) algorithm[7], student posture data based on MediaPipe, attention algorithm design, result recording and analysis.

4.1 Face Recognition

In this paper, SSH algorithm is used to implement face target detection in classroom scenes. The main steps are as follows:

a)Grayscale processing is carried out to reduce the influence of illumination.

b)Input the pre-processed images into SSH algorithm, set the rectangular face box and record the face coordinates.

c)Traverse all face coordinates, and define the prediction frame whose coordinate value is greater than the reference value as the real face.

4.2 Expression Recognition

AlexNet network structure is adopted as the model of student expression recognition [8]. The main process of student expression recognition is as follows. The first is to define students' expressions; the second is to obtain the coordinates of facial key points based on LandMark technology; the second is to calculate the curvature of eyes, mouth corners and eyebrows based on the above coordinates; the expression feature coefficient is calculated based on the above features, and the expression label is redefined by the detection data for the training of AlexNet expression recognition model. There are six types of expressions used in this article, including happy, confused, understanding, listening, incomprehension, and rejection. AlexNet's accuracy rate in classroom students' expression recognition is shown in Table 2.

Table 2. The accuracy of AlexNet's expression recognition of students

Expression	happy	confused	understanding	listening	Incomprehension	rejection	average
Accuracy	91.5%	80.1%	86.3%	82.6%	75.3%	73.1%	81.5%

4.3 Posture recognition

In class, students' head posture can express students' attention situation to some extent. In this paper, if the student's head is not facing the blackboard normally for a period of time, it is considered that the student is not concentrating. This paper divides students' head movements into five directions: head up, head down, left turn, right turn and forward turn [9]. In this paper, the direction of head rotation of most people is set as the direction of concentration. If the head rotation direction of the tested students is opposite to that of most people, it will be judged as inattentive.

4.4 Attention Evaluation

In this paper, students expression and the direction of head rotation were used as the first level evaluation index, emotional state score was calculated according to expression, posture state score was calculated according to the direction of head rotation, and emotional state coefficient and posture state coefficient were used as the second level evaluation index [10], which are shown in Table3.

Table 3. Attention evaluation index

The first level indicators			The second level indicators		
Name	symbol	weight	Name	symbol	weight
Rejection counts	F1	W1	Emotional score	F1	W1
Incomprehension counts	F2	W2			
Listening counts	F3	W3			
understanding counts	F4	W4			
Confused counts	F5	W5			
Happy counts	F6	W6			
Postural focus	F7	W7	Postural score	F2	W2
Postural inconcentration	F8	W8			

In this paper, the attention evaluation score is set as S. When 0<=S<=40, students are inattentive. When 40<S<=70, the students' attention is normal. When 70<S<=100, students are highly attentive.

4.4.1 Emotional score

The frequency of six kinds of expressions appearing in class during the period was taken as the coefficient of the first level evaluation index to score the expressions. The index factor set is shown in Equation (1). After normalizing the frequency of expression, we can get A in Equation (2).

$$\overline{\mathrm{A}} = \{\overline{E1}, \overline{E2}, \ldots \ldots, \overline{E6}\} \tag{1}$$

$$\mathrm{A} = \{\mathrm{E1}, \mathrm{E2}, \ldots \ldots, \mathrm{E6}\} \tag{2}$$

The calculation process of Ei is shown in Equation (3).

$$\mathrm{Ei} = \frac{\overline{Ei}}{\sum_{i=1}^{6} \overline{Ei}}, \quad i = 1,2,3,4,5,6 \tag{3}$$

Construct the judgment matrix, the result is shown in Equation (4).

$$\overline{C} = \begin{matrix} \overline{c_{11}} & \overline{c_{12}} & \overline{c_{13}} & \overline{c_{14}} & \overline{c_{15}} & \overline{c_{16}} \\ \overline{c_{21}} & \overline{c_{22}} & \overline{c_{23}} & \overline{c_{24}} & \overline{c_{25}} & \overline{c_{26}} \\ \overline{c_{31}} & \overline{c_{32}} & \overline{c_{33}} & \overline{c_{34}} & \overline{c_{35}} & \overline{c_{36}} \\ \overline{c_{41}} & \overline{c_{42}} & \overline{c_{43}} & \overline{c_{44}} & \overline{c_{45}} & \overline{c_{46}} \\ \overline{c_{51}} & \overline{c_{52}} & \overline{c_{53}} & \overline{c_{54}} & \overline{c_{55}} & \overline{c_{56}} \\ \overline{c_{61}} & \overline{c_{62}} & \overline{c_{63}} & \overline{c_{64}} & \overline{c_{65}} & \overline{c_{66}} \end{matrix} \tag{4}$$

The matrix can be obtained by column normalization from Equation (5).

$$\mathrm{C} = (c_{ij})_{6*6}, \ i, j = 1,2,3,4,5,6 \tag{5}$$

C is normalized according to the row to obtain the feature vector W, as Equation (6).

$$\mathrm{W} = \{W1, W2, W3, W4, W5, W6\}^T \tag{6}$$

The value of Wi is shown in Equation (7).

$$\mathrm{Wi} = \frac{c_{ij}}{\sum_{j=1}^{6} c_{ij}} \qquad i, j = 1,2,3,4,5,6 \tag{7}$$

The W vector was used as the factor weight of each expression index to calculate the emotion score, which is shown in the Equation (8).

$$\mathrm{S1} = 100 \cdot \mathrm{AW} = 100 \cdot (E1, E2, E3, E4, E5, E6) \cdot \begin{matrix} W1 \\ W2 \\ W3 \\ W4 \\ W5 \\ W6 \end{matrix} \tag{8}$$

4.4.2 Posture score

The score of students' head direction is between 0 and 9. If it is less than 4, students' attention is considered to be distracted, and the number of distraction is H1. If the number is greater than or equal to 4, the student is in the position of concentration, and the concentration order is H2. The pose score is calculated according to H1 and H2, S2=0*H1+1*H2.

Based on the second level coefficient, the calculation formula of attention score is defined as:

$$\mathrm{T} = \mathrm{S} \cdot \mathrm{W} = (\mathrm{S1}, \mathrm{S2}) \cdot \begin{matrix} W1 \\ W2 \end{matrix} \tag{9}$$

4.5 Attention Analysis

The teaching of software engineering courses is carried out for two classes with similar learning styles of software engineering major. The teaching content of the two courses is the demand analysis part of software engineering. Class 1 does not adopt the teaching method of ideological and political teaching, and Class 2 adopts the teaching method of ideological and political teaching. Ten students were enrolled in each class and their attention was measured at five-minute intervals over a 45-minute period. The result of students' attention without applying ideological and political thinking in the curriculum is shown in Table 4, then Table 5 is the result with ideological and political application.

Table 4 Students' attention without applying ideological and political thinking in the curriculum

Class1	1m	5m	10m	15m	20m	25m	30m	35m	40m	45m
student1	73.21	72.69	60.59	78.31	72.81	68.56	65.31	70.82	68.39	64.38
student2	76.91	67.29	76.92	85.69	80.21	68.14	64.33	56.1	60.25	62.37
student3	53.24	41.25	65.87	70.49	77.39	71.52	68.49	75.84	70.14	63.54
student4	62.43	36.94	25.86	43.91	58.76	54.7	63.21	44.39	58.76	41.28
student5	85.29	92.1	71.29	84.36	76.51	89.15	85.62	76.37	70.22	67.21
student6	48.95	33.87	56.84	53.1	65.43	52.73	30.18	44.21	39.76	41.31
student7	86.79	76.58	74.29	80.31	82.36	71.48	70.59	68.34	65.29	60.24
student8	91.57	86.29	75.21	73.64	82.91	70.59	76.31	74.53	70.18	73.21
student9	59.27	43.28	31.28	48.49	50.76	40.28	38.76	27.68	33.75	30.48
student10	76.81	65.86	54.71	49.48	59.27	66.43	58.91	62.71	60.58	58.76

Table 5 Students' attention of ideological and political application in the course

Class2	1m	5m	10m	15m	20m	25m	30m	35m	40m	45m
student1	83.56	83.30	82.19	85.29	86.18	87.15	91.23	92.40	86.79	72.31
student2	78.54	76.39	82.01	81.46	79.64	86.25	88.21	84.71	76.57	69.37
student3	68.73	66.49	70.21	72.36	69.78	70.28	83.61	82.59	77.40	70.16
student4	72.53	68.30	70.21	73.26	72.59	75.68	80.69	83.47	79.21	74.06
student5	86.79	90.12	85.36	84.17	87.25	92.56	84.17	96.18	89.54	78.42
student6	82.16	84.33	75.21	70.65	79.51	84.76	83.51	94.33	81.26	74.22
student7	68.32	72.36	60.42	34.78	45.21	77.32	86.93	71.45	66.31	53.10
student8	56.91	45.36	64.70	67.52	73.68	77.08	72.31	60.33	54.78	39.68
student9	90.31	86.25	74.17	83.24	70.29	88.52	93.26	81.74	86.10	76.91
student10	46.98	67.29	59.34	76.20	64.33	78.26	89.67	71.28	35.89	65.87

The comparison results of the two teaching situations are shown in Fig.1. As can be seen from the Fig.1, when ideological and political content is not introduced into the curriculum(left), students' attention attenuates as class time goes on. However, for the class(right) in which ideological and political teaching is introduced, especially between 20 minutes and 40 minutes when ideological and political cases are introduced, students' attention is kept at a relatively high level.

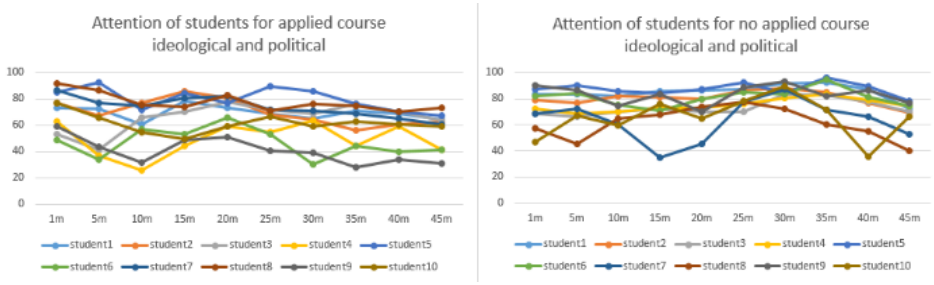

Fig. 1. The fluctuation of students' attention in two teaching situations

5 Conclusions

The construction of the software engineering case resource library based on curriculum ideology and politics is not only based on curriculum ideology and politics, but also provides a set of effective teaching ideas and solutions for the theoretical and practical teaching of software engineering courses in accordance with the laws of education and teaching. In order to help students to master the knowledge and technology of each stage of the software life cycle model, it also pays more attention to the cultivation of students as adults. At the same time, students' teamwork ability, internal expression and professional quality have also improved to a certain extent.

In some cases, the implementation process is more complicated. The lack of experience in project discussion and demand analysis of each group may lead to the risk of demand inflation. Later considerations guide students to use flowcharts to simulate the business execution process. Prior to the analysis and discussion of each group, emphasize the discussion method and the basic situation of demand to prevent demand expansion.

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