Scholar Publishing Group
International Journal of Educational Innovation and Science
https://doi.org/10.38007/IJEIS.2022.030203
ISSN 2789-7184 Vol. 3, Issue 2: 16-25

Application-oriented Transformation and Development of Private Undergraduate Universities Based on Fuzzy Clustering

Xiufang Wu and Xiaoying Sun

NanChang Institute of Science and Technology, Nanchang 330108, China

1334416490@qq.com

Keywords: Private Undergraduates, Applied Universities, Fuzzy Clustering, Transformational Development

Abstract: With the rapid development of our country's economy, the society's demand for talents is also increasing. As the cradle of cultivating professional technical talents, private schools have gradually become an indispensable education base in the higher education system. Among the many types of courses, there are many subjects with application as the main characteristic in our country. For example, computer and information engineering, electronic information technology, etc. Then, for how to transform and develop applied courses in private undergraduate colleges and universities, this paper conducts certain research based on fuzzy clustering. This article mainly uses survey questionnaire method, expert analysis method, comparative research method and data access method to conduct research on the application-oriented transformation of private undergraduate colleges and universities. Through investigation and analysis, it is found that there are indeed some problems in the application-oriented transformation of private undergraduate colleges and universities in our country. 86.52% of people think that there are still big problems in the construction of the teaching team.

1. Introduction

At present, the national economy and society are in the stage of industrial transformation, and a large number of high-level and high-quality applied-skilled talents are needed; at the same time, the number of college graduates is increasing rapidly every year, and the problem of college students' employment difficulties is becoming more and more prominent. At present, the technical level of the students trained by the colleges and universities in our country is relatively low, and the professional foundation is relatively weak. Graduates are rarely able to think deeply and upgrade their skills to the advanced level. Only by continuously subdividing the talent structure to make up

for the needs of various technical talents in the development of industrialization can the graduates cultivated by colleges and universities meet the ever-developing employment environment and improve their core competitiveness. Therefore, it is indeed necessary for private undergraduate colleges and universities to conduct applied transformation and development research.

There are many studies on the application-oriented transformation and development of private undergraduate universities. For example, some scholars have clearly defined the connotation of private undergraduate colleges and applied undergraduate colleges through collation and research, and further summarized the main tasks and paths of the transformation to application-oriented [1]. Some scholars believe that under the new economic normal, higher education is facing unprecedented external changes, and the forward-looking nature requires applied undergraduate colleges to explore transformation and development paths [2]. In addition, some scholars have proposed that in our country's future higher education system, a large number of universities will be transformed into universities of applied technology. Private colleges and universities are facing many difficulties in their transformation to application-oriented undergraduates[3].

This article mainly explores the background and necessity of application-oriented transformation of private undergraduate colleges and universities, and expands the content of its transformation and development. Then, according to the fuzzy clustering algorithm, the application-oriented transformation method is optimized, analyzed the current application-oriented talent training model, and the countermeasures for the transformation of private undergraduate colleges and universities are studied.

2. Application-Oriented Transformation and Development of Private Undergraduate Colleges and Universities

2.1. The Background and Necessity of the Transformation of Private Undergraduate Universities

(1) Background

1) The talent training model of higher education is out of balance, and the supply and demand of talent specifications are seriously misaligned. At present, our country's higher education talent training model is out of balance, and the irrational educational structure is becoming more and more prominent. The employment pressure of graduates is increasing, and the employment situation is becoming increasingly severe. Our country is constantly accelerating the adjustment and upgrading of industrial institutions, so there is a shortage of high-level applied-skilled talents. In light of this situation, the state clearly proposes to strengthen employment-oriented and promote our country's application-oriented talent training and education in the education system. In addition, the Ministry of Education of our country has also made it clear that the current focus of work will be to guide some colleges and universities to carry out technological transformation, which means that local ordinary undergraduate colleges and universities will face a turning point in vocational education [4].

2) The positioning of local ordinary undergraduate universities and research universities is converging. Over the years, local ordinary undergraduate universities have targeted research universities and are positioned in the application and construction of master's programs. Positioning errors and lack of scientificity have led to the continuous growth of local ordinary undergraduate universities, but the effect is not good.

3) The degree of matching between disciplines and majors is low with market demand. The severe employment situation has aroused widespread concern. The current employment situation of

college graduates has become a key difficulty for society and the country, triggering widespread public opinion. Local undergraduate colleges and universities train applied talents to serve local economic and social development in line with the requirements of society and the school's own development, but the tendency of "disciplinarity" in the professional setting of some local undergraduate colleges is still obvious. The biggest problem with the "disciplinarity" of the professional setting is that it rarely considers market demand and only focuses on the development of disciplines. This problem not only restricts the quality of local undergraduate universities to train applied talents, but also affects the survival and further development of local undergraduate universities [5].

(2) Necessity

The transformation of local ordinary undergraduate colleges and universities to application-oriented universities is a requirement of economic and social development, and it is also an extension and deduction of the inherent logic of higher education. This has aroused the general concern of the public, and the transformation of colleges and universities has become the trend and trend of historical development.

1) The needs of social and economic development [6]. At present, the continuous innovation and integration of industrialization and information industry, while the transformation and upgrading of industrial institutions, labor-intensive industries and industries with backward technology are gradually being eliminated, while capital-intensive industries and high-tech industries are growing rapidly. The characteristics of the development of various industries in the future are manifested as high knowledge, high skills, and high added value.

2) The structural adjustment of the higher education system requires transformation. Our country's education system needs to build a diversified system to adapt to the social and economic development trend after industrialization transformation and upgrading. The development of ordinary undergraduate colleges and universities today still has some problems in their positioning, such as fuzzy positioning, swinging roles, striving to build a comprehensive research university, building tall buildings, etc. to follow suit. This has seriously hampered the diversified development of education and made it uniform in a thousand schools, which was a waste of resources and failed to achieve the results of running a school.

3) The inevitable development of local ordinary undergraduate colleges and universities [7]. Because most local ordinary undergraduate colleges have a relatively short history of establishment, the level of teachers is quite different, and the discipline construction is not perfect, but relatively speaking, there is a relatively large room for development, and there are some problems that cannot be solved by itself.

2.2. Contents of the Transformation and Development of Undergraduate Colleges

Combining with the current demand for talents in our country's economic development and the difficulty of obtaining employment for university graduates, the central and local governments have formulated and promulgated policy documents to actively guide local universities to participate in the transformation. The transformation and development of private undergraduate colleges and universities should be based on local economic and social development needs, and meet their needs for talents, faculty, professional construction, practical teaching and other comprehensive and comprehensive changes and reforms.

(1)Accurate positioning of talent training goals [8]. The goal of cultivating talents in applied universities is the cultivation of applications and skills. While the universities and enterprises

develop school-enterprise cooperation, they also cultivate students' practical theoretical knowledge and awareness of innovation and entrepreneurship, and focus on the cultivation of students' skills and practical skills, and they will have the ability after graduation, become a senior technician and engineer, etc.

(2)The construction of professional disciplines should incorporate local characteristics. The professional positioning and construction of applied universities must adapt to local economic and social development, set up majors according to local economic characteristics, and give play to and apply the advantages of local industrial development. In the formulation of the talent training model, it is necessary to highlight the characteristics of the combination of education and enterprise, pay attention to school-enterprise cooperation, and the level of classroom teaching and undergraduate teaching must be consistent. In classroom teaching, the teaching of applied technology and skills must be emphasized, and active exploration and practice school-enterprise cooperation mode training mechanism.

(3)Build a team of dual-qualified teachers. Applied universities require a clear distinction between the construction of faculty and the faculty of research universities. Therefore, it is necessary to change concepts in the structure and construction of the teaching staff, to focus on skills and application as the school-running philosophy, to establish the development of applied talents, to improve the ability to serve the local economy and society, and to improve the school's characteristic school-running level. At the same time, improve the flow mechanism between teachers and corporate employees between enterprises and schools.

(4)Strengthen school-enterprise cooperation and improve the practical curriculum model. In order to improve students' application technology level and ability, application-oriented colleges and universities should pay attention to practical teaching links. At the same time, local governments and various industries assist universities in running schools [9].

2.3. Fuzzy Clustering Algorithm

The calculation of fuzzy clustering algorithm is very large, and the most widely used is the clustering method based on objective function. The distance between each sample and each type of prototype is weighted by its membership square, and it is expanded to the within-class weighted error square sum objective function to get a more general description. Based on the fuzzy algorithm, this article explores the optimal mode of application-oriented transformation of private undergraduate colleges [10].

Suppose the sample set to be classified is $Y = \{Y_1, Y_2, \Lambda\ , Y_m\} \subset W^{m\times p}$, m is the number of elements in the sample set, and p is the dimension of the feature space. Among them, $s_{il}(1 \le i \le d, 1 \le l \le m)$ represents that the membership degree of the l-th sample belonging to the i-th category shall be met, and the following two constraints shall be satisfied:

$$\sum_{i=1}^{d} s_{il} = 1, 1 \le l \le m \tag{1}$$

$$0 \le s_{il} \le 1, 1 \le i \le d, 1 \le l \le m \tag{2}$$

Bezdek defines a general description of the fuzzy c-means clustering algorithm:

$$B(S,Q)=\sum_{l=1}^{m}\sum_{i=1}^{d}(s_{il})^{n}(c_{il})^{2},m\in[1,\infty) \quad (3)$$

So $S\in N_{xd}$, where n is called the fuzzy weighting index, which controls the fuzzy degree of the classification matrix S.

2.4. Typical Model of Application-Oriented Talent Training

(1) Existing Problems

Application-oriented talents need not only the scientific research capabilities of research-oriented theoretical talents, such as application-oriented talents who need to transform some scientific research results into products; they also need hands-on ability, such as application-oriented talents who need to solve various problems that occur on the production line[11] .

1) The training goal is misplaced with the training process. In the training process of undergraduate colleges and universities, some schools use the method of cultivating research-oriented talents to train applied talents, and some schools use the method of skilled talents to train applied talents.

2) There is no distinction between theory and practice teaching. In the specific training process, the proportion of theoretical courses offered by some schools is too large, while the number of courses on the nature of applied practical production is relatively small, and practical teaching is rarely used for teaching.

3) The quality of training lacks multiple evaluation indicators. At present, the government and some local undergraduate colleges and universities have not considered the characteristics of applied talents, and still use such standards as publishing papers and examination results as the final evaluation of talent quality. At present, there is a lack of evaluation of the quality of application-oriented talent training, such as the evaluation of the learning process, the evaluation of the mastery of skills, and the evaluation of product inventions.

(2) Typical Model Of Talent Training

1) "Embedded" mode. One is one-way embedded, which is embedded in each other in the form of school-enterprise cooperation according to their own needs; the other is two-way embedded, which actively embeds each other through joint participation and cooperation. Its advantage is that it does not disrupt the normal teaching plan and meets the specific requirements of the enterprise or the employer on the knowledge, skills and quality of talents.

2) "Order-based" mode. The first is for students to sign a training agreement with the company when they enter the school. After the agreement is signed, the talent training plan and learning plan are carried out in accordance with the requirements of the company; the second is for the student to sign a training agreement with the company after completing the first year of study. Adjust the teaching plan for the next two years in accordance with the requirements of the company; the third type is that after the students complete the second year of study, they sign a training agreement with the company, and complete the professional courses and professional practice required by the company in the last year. This talent training model solves the problem of low employment rate for schools, solves the problem of employment for most students, and also provides enterprises with talents that meet the needs of enterprises. It can be said to be a "triple win-win" model[12].

3) "Industry-University-Research" model. The "production-study-research" talent training model refers to a talent training model that combines production, learning and scientific research. The advantage of this model is that it can combine the good educational resources of schools and

enterprises or scientific research units.

4) "Trinity" mode. Among the educating subjects, schools, enterprises and research institutions each undertake different tasks of cultivating applied talents; in the curriculum system, general education courses allow students to learn extensive knowledge, professional courses allow students to learn application skills, and career courses allow students learning to adapt to society; among the training methods of learning, applying and creating, applying what has been learned is the core method.

2.5. Countermeasures for the Transformation of Private Undergraduate Colleges and Universities

(1) Change the ideas and concepts of reforming school running, and do a good job of top-level design. Local undergraduate colleges and universities have advanced concepts and pursuits that are necessary conditions for transformation and sustainable development. Advanced school-running concepts are mainly manifested in three aspects: first, keeping up with the development of the times and meeting the needs of local economic development trends; second, the school has its own unique characteristics, local colleges and universities must compete with other colleges and universities with their unique school-running characteristics in order to win development space and achieve healthy and sustainable development; third, thinking advances with the times, predicting future economic and social development trends, serving and promoting local economic and social development, so as to promote the continuous progress of local higher education.

(2) Pay attention to the transformation of discipline and specialty construction. Transforming into an applied university needs to cultivate talents that meet the needs of local economic development, conform to the adjustment and upgrading of local industries, link key industries and industries, combine its own advantages to position itself in specialty and professionalism, and cannot blindly expand in scale. According to the local characteristics, the professional setting and talent training model are combined with the local key industries and competitive industries to cultivate high-quality talents with knowledge and practical skills for the local economic and social development.

(3) Pay attention to the transformation of application course content. Compile the front-line work content into the curriculum. The course outline is designed as the actual work process, and the teaching content of the practical course is realized through different work scenarios, so that the theoretical knowledge is closely linked with the actual work. This is a new type of curriculum reform plan.

(4) Strengthen the transformation of the construction of the teaching team. Teachers are the main body that cultivates and teaches applied skills talents. "Double-qualified" teachers are the requirements for teachers of higher vocational colleges.

(5) Realize the transformation of diversified school-running models. Transform a single participant into an open and diversified school-running model. Achieving an open and diversified school-running model can promote cooperation between college alliances, thereby continuously increasing the number of participating colleges and universities, gathering the strength of members in the alliance, and forming an interactive joint force.

(6) Accelerate the transformation of traditional management systems and mechanisms. The transformation work requires colleges and universities to actively recognize the problems and difficulties in the process of transformation, and to correctly face the post adjustment brought about by the transformation. Therefore, local ordinary undergraduate colleges and universities need to

rationally optimize the staffing, and through methods such as concept guidance and benefit-driven, so that all levels of participants in the transformation can actively contribute to the transformation.

3. Investigation Experiment on Applied Transformation of Private Undergraduate Colleges and Universities

3.1. Experimental Background

Private undergraduate universities are transforming into applied universities, which will be an important task for the improvement and reform of the higher education system in the future. Under this situation, some local general undergraduate colleges and universities have actively carried out transformation work, but most local general undergraduate colleges and universities still hold a wait-and-see attitude, and some colleges and universities have even experienced teachers and students resisting the transformation of the school into an application-oriented university. Therefore, the transformation to an applied university cannot be achieved in one step. It requires a gradual process. Many problems and difficulties may arise in this process, which will affect the smooth progress of the transformation.

3.2. Questionnaire Design

The survey was conducted around the internal teachers and administrators of private undergraduate colleges transforming into applied universities, mainly in six aspects: professional setting, ideology, faculty, curriculum setting, management system and school-running model. The status quo of the transformation and the emergence of the transformation process Investigate the problems and predicaments of the company, and provide data support for this study. A total of 300 questionnaires were distributed, of which 250 were valid points, and the effective response rate of the questionnaires reached 83.3%. The questionnaire is drawn from randomly selected teachers, including teachers of different genders, ages, educational backgrounds, professional titles, and positions.

4. Analysis of the Application-Oriented Transformation of Private Undergraduate Colleges and Universities

4.1. Basic Situation of the Survey Object

According to a sample questionnaire survey, among the surveyed teachers, mainly young and middle-aged teachers, and they are generally highly educated talents, as shown in Table 1:

Table 1. The basic situation of the survey object

		Number of people	Percentage
Gender	Male	120	48%
	Female	130	52%
Age	More than 50	30	12%
	30-50	100	40%
	20-30	120	48%
Educational Background	Postgraduate and Above	122	48.8%
	Undergraduate	103	41.2%
	Specialist	25	11%

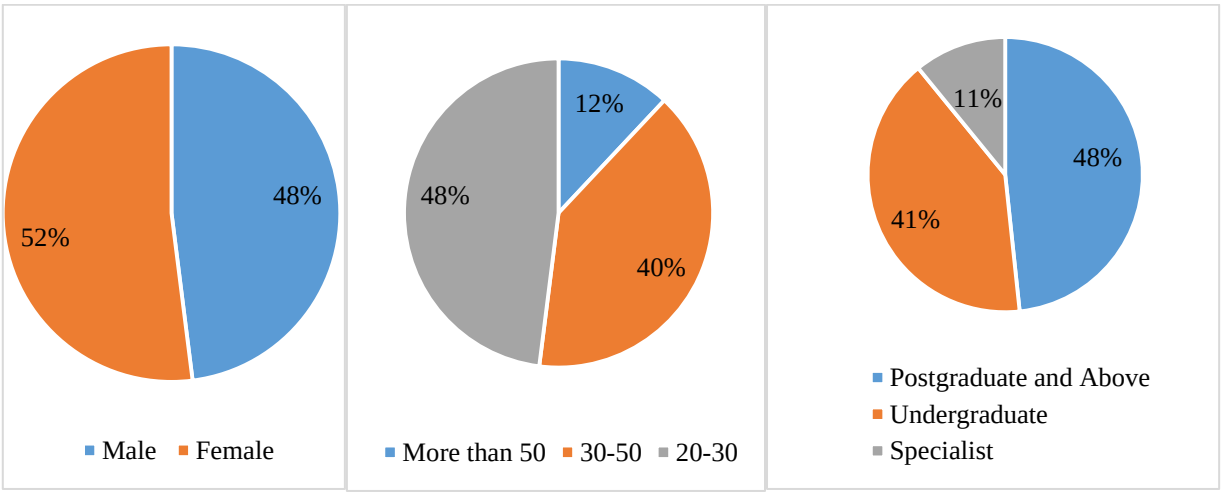

Figure 1. The basic situation of the survey object

As shown in Figure 1, we can see that there are three pie charts, and each pie chart represents a different teacher situation. We can know that among the teachers of private undergraduate colleges and universities, the majority are female teachers and there are fewer male teachers. Young teachers are the majority, the middle-aged teachers are a bit less, and the older teachers are the least. Among them, in terms of academic qualifications, most of them are graduate students and above.

4.2. Analysis of Problems in the Process of College Transformation

(1) Ideological Concepts and School-Running Ideas

Table 2: Ideas and ideas for running a school

	Yes	No
Transformation Goals	88.2%	11.8%
Should?	73.5%	26.5%
Is Backward Thinking a Limiting Factor?	60.1%	39.9%

As shown in Table 2, 88.2% of teachers choose “Yes”and 11.8% of teachers choose “No” as to whether the transformation goal is application-oriented. In the question of whether to locate the target, 73.5% of the teachers chose "Yes". From these two issues, the transformation goals of local ordinary undergraduate colleges and universities have been basically recognized by everyone, but 60.1% of teachers still choose "Yes" for the problem of backward concepts hindering development. It can be seen that the constraints of transformation concepts and thinking have seriously affected Transformation development.

(2) Faculty Construction Issues

With the generalization of higher education, the scale of college teachers is also expanding, and its structure changes accordingly. On the whole, the source of newly hired teachers mainly comes from the flow of graduates and teachers, which is limited by the personnel system restrictions imposed by corporate scientific research institutions. At present, the faculty of colleges and universities comes from graduate students in key universities and scientific research institutes, and the work history and source channels are relatively single, and the teachers lack practical experience in the industry. The specific transformation dilemma is shown in Table 3:

Table 3. Faculty building

	Yes	No
Double-taker to 30%?	20.12%	79.88%
Good Social Evaluation?	35.29%	64.71%
Lack of policy support?	86.52%	13.48%

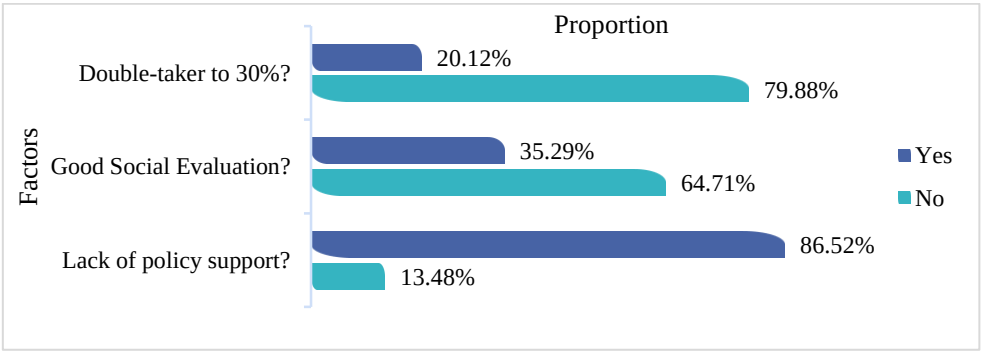

Figure 2. Faculty building

Regarding whether the dual-qualification type reached 30%, most teachers chose "No", expressing dissatisfaction (see figure 2). There is also a lack of policy support for teacher promotion, 86.52% of teachers agree. From this point of view, the problem of the teaching team is relatively large. Some experts and professors believe that the academic qualifications of the teaching staff should be graduate students, and there is a serious idea of emphasizing theory and neglecting practice.

5. Conclusion

The transformation and development of private undergraduate colleges and universities has been a major strategic deployment of the country in recent years, and the application-oriented talent training model is related to the real realization of transformation and development. At this stage, there are indeed many problems and deficiencies in the policy documents issued by governments at all levels to guide the transformation of colleges and universities, both in terms of policy operation and policy content. However, the transformation of colleges and universities is in line with the needs of our country's economic development and conforms to the needs of our country's higher education. Education structure adjustment and reform requirements. Therefore, the existence of many transformation problems does not deny the rationality of the overall trend of the transformation of local undergraduate universities. At this stage, governments at all levels, universities and local enterprises should work together to actively improve the content and policies of the transformation policy, and give full play to the guiding function of the transformation policy. Standardize the operating process of the transformation policy, effectively improve the effectiveness of policy implementation, and ensure the smooth development and implementation of the transformation work of local undergraduate colleges and universities.

Funding

Project funding: Science and Technology Research Project of Jiangxi Provincial Department of Education (No. GJJ191101)& (No. GJJ202504).

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] *Zhang Ning, Du Fang. Analysis on Status Quo of Transformation of Local Undergraduate Colleges and Universities in Yunnan: Taking 9 colleges and universities in Yunnan as an example. Yunnan Radio University News, 2017, 019(002):63-67.*

[2] *Bo Z. Research on Cultivation Scheme Based on TPB of Entrepreneurial Talents in Chinese Local Application-Oriented Universities. Eurasia Journal of Mathematics Science & Technology Education, 2017, 13(8):5629-5636. https://doi.org/10.12973/eurasia.2017.01016a*

[3] *Wei Chen. Countermeasure Research on Humanistic Care of Student Affairs in Newly-Established Application-Oriented Universities. Advances in Social Sciences, 2020, 09(8):1158-1161. https://doi.org/10.12677/ASS.2020.98161*

[4] *Liu Y, Shi L, Liu L. Research on the Realization Path of Application-Oriented University. Open Journal of Social Sciences, 2020, 08(6):387-393. https://doi.org/10.4236/jss.2020.86029*

[5] *Guo, Rongchun. Optimization Reform of Education Mode for Dissertations of New Media Majors in Application-oriented Universities. Campus English, 2020, No.497 (05):28-28.*

[6] *Li Yanfei, Chen Guodong, Wang Na, etc.. Discussion on the Construction of College Students' Mental Health Dynamic Monitoring System in Application-Oriented College--Taking Zhonghuan Information College Tianjin University of Technology as an example. Journal of Tianjin Agricultural College, 2018, 025(002):97-101.*

[7] *Song Binbin, Gao Lina. Effective Teacher Talk Strategies in College English Teaching in Application-oriented Universities\\r- Taking Text Teaching as an Example%. Journal of Hubei Second Normal University, 2019, 036(005):13-17.*

[8] *Wang Feiyan. Reform Exploration on College English Courses in Application-oriented Institutes--The Case Study on Nantong Institute of Technology. Campus English, 2016(11):6-7.*

[9] *Cao Yunhua, Yu Zengyan, Jiang Jing, etc.. Exploration on Psychology of Talents Training Mode in Local Application-oriented College in Context of Innovation Entrepre-neurship. China Educational Technology Equipment, 2018, 000(023):70-72.*

[10] *Tran D H, Cheng M Y, Pham A D. Using Fuzzy Clustering Chaotic-based Differential Evolution to solve multiple resources leveling in the multiple projects scheduling problem. Alexandria Engineering Journal, 2016, 55(2):1541-1552. https://doi.org/10.1016/j.aej.2016.03.038*

[11] *Thong P H, Le H S. An Overview of Semi-Supervised Fuzzy Clustering Algorithms. International Journal of Engineering and Technology, 2016, 8(4):301-306. https://doi.org/10.7763/IJET.2016.V8.902*

[12] *Pan S, Shang C, Chen T, et al. Exploiting data reliability and fuzzy clustering for journal ranking. IEEE Transactions on Fuzzy Systems, 2017, 25(5):1306-1319. https://doi.org/10.1109/TFUZZ.2016.2612265*