

# Exploration and Practice of Coordinated Development of Teachers and Students in Innovation and Entrepreneurship Education of Artificial Intelligence

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**Abstract**—Among application-oriented universities, there are problems of incomplete teaching staff construction, emphasis of student training, lacking learning motivation, and lack of cooperation and exchange platform. Based on analyse of current situation of artificial intelligent talents cultivation, it was proposed about problems of improvement of teachers' ability and student training, and targeted solutions were advised. It was thought that goals of AI talents cultivation were the developer teacher and experienced and applied student, whose development paths were established, which can be carried on by coordinated development of teachers and students. The cultivation system was structured by innovative undertaking platform construction of teachers and students, team selection mechanism, diversified study driving, building a teaching team of teachers and students, and capability development driven by integration of expertise and innovation.

## 1 Introduction

Recently, along with fast development and industrial application landing of AI technology, artificial intelligence majors were opened in many Chinese colleges and universities. More eligible and urgent need talents are required to be cultivated in AI area. Focusing on cultivating the industrial application talents, some application-oriented undergraduate universities opened artificial intelligence majors too. However, resources and facilities of teaching and scientific research are not complete, and cultivating modes and practical experiences are still explored and accumulated [1]. Based on their core AI technology and training platform, some leading enterprises in IT field are actively training AI teaching staff. Under the support and promoting, AI talents cultivation of colleges and universities are helped by the way of Production-university-research collaboration education [2-3].

For the past few years, many research institutes, universities and enterprises are paying close attention to abroad studies of AI talents cultivation. In terms of the newest research results of University of Cambridge, 29 percent authors had Chinese undergraduate degrees in accepted papers by NeurIPS, but 54 percent graduates pursued master's degree in USA, and 90 percent of them chose to work in USA. At present, USA is still playing a leading role in AI talents. In respects of level and scale,

cultivation mode, career development path, and marketing environment, some abroad AI powerful countries have great first mover advantage, which guide the development of global AI technology.

Some studies were carried out inland, such as career development direction, study guide, integration of majors and business, and integration of industry and education, and some theoris and application experiences were accumulated. However, current studies and practice are mainly revolving around the improvement of students' professional level, construction of curriculum system, reform of teaching methods, school-enterprise cooperation [4-6], and faculty training [7], but there are few studies about combination of teachers ability development and improvement of students' professional level for realizing coordinated development. The open and cooperative AI talents cultivation system should include students and teachers, which are supplement each other and equal importance, so the teachers' ability and level are important for cultivation quality of students. Especially in application-oriented undergraduate universities, the cultivation quality of eligible application talents is decided by the teachers' industrial practice level.

At the same time, the characteristics of application-oriented undergraduate universities should be considered. Over a period of time, there are only undergraduate education and no postgraduate education in AI major of theirs, so the students' ability cultivation is different of public collge. On the basis of conventional teaching, techniques of motivating students' self-directed learning

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should be explored, and favorable learning atmosphere is created to make them be interested in professional learning and rise in great vigor, which will make them grow into eligible application talents.

## 2 Status analysis of Applied ai Talents Cultivation

Most colleges and universities opened artificial intelligence majors in recent years. Because of fast development of AI technology, talents working on AI education are scarce, and facilities construction experiment, training and scientific research of is incomplete, which resulted in unevenness of teachers level and requirement of continuous optimization for structure of teaching staff. Especially, it is needed to study and act out how should AI teachers of application-oriented undergraduate universities promote level of expertise to meet the needs of cultivating eligible talents.

For cultivating applied AI talents having good theoretical basis, strong practical ability and excellent industrial insight, it is required of excellent teachers of knowing industry, understanding theories and being good at development to guide [8]. However, there are some difficulty in the ability development of AI major teachers of application-oriented undergraduate universities, which mainly show in theoretical basis being not solid, platform tool application being not skilled, professional ability being incomplete, practical experiences being deficiency, industry thinking being not shaped, integration of profession and business being difficultly landed and

teaching research being not deep. So as to solve these difficulties, teachers are required to study hard around these aspects.

The target of application-oriented undergraduate universities is to cultivate the applied talents, and their students could have an insight into industries and stronger ability to solve practical problems. However, because of several reasons, approaches of gaining experiences for students are limited, who's applied ability is deficiency to solve practical problem, and some prominent difficulties exist, such as lack of confidence and consciousness, lack of learning initiative, lack of application experiences, being difficult to study deeply, and lack of cooperative of spirit of group. So, we must help students solve these problems, and deepen understanding of industrial requires, which can truly enhance their application ability of AI technology.

## 3 Development Path of Developer Oriented Teacher

Aiming at the difficulties faced of teachers' ability enhancement, based on theoretical exploration and accumulation of practical experiences in the past two years, characteristics of AI technology with application as traction and integration of industry and education, an excellent AI major teacher of application-oriented undergraduate universities should walk along the growth path of developer oriented teacher benchmarking standard of senior engineer [9]. It is showed as Fig. 1.

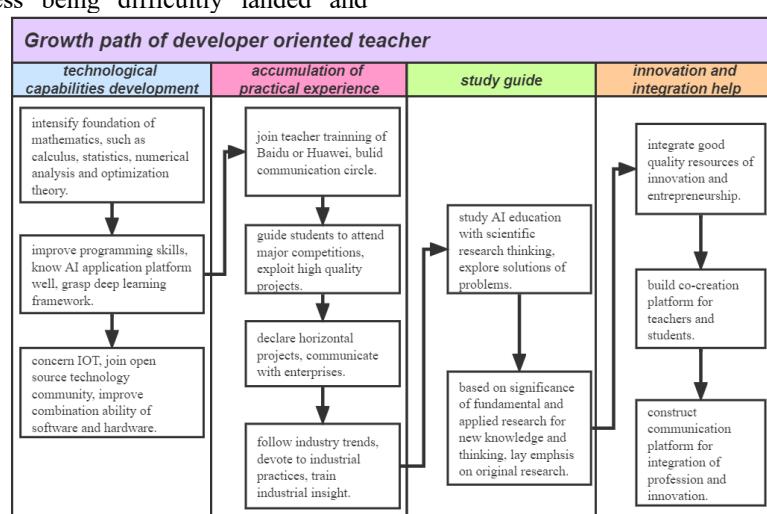


Figure 1. Growth path of developer oriented teacher.

## 4 Cultivating Path of Experience Oriented and Applied Talents

AI major students of application-oriented undergraduate universities should lay emphasis on self-motivation, community learning and mutual assistance, upgrade of

technical level and accumulation of practice experience, can apply AI technology to industrial practices, that is, struggle to be experience oriented and applied talents [9]. Only in this way, graduates can throw themselves into AI industrial practices with practical skills. It is showed as Fig. 2.

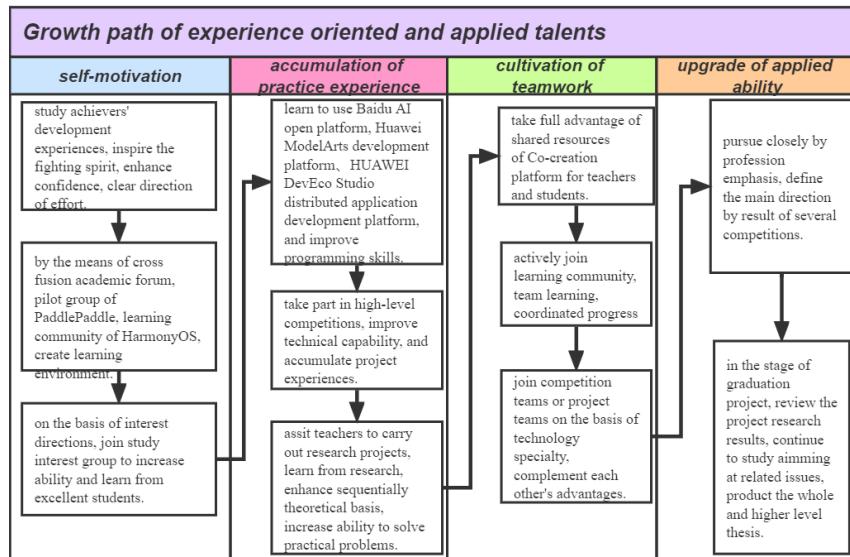


Figure 2. Growth path of experience oriented and applied talents.

## 5 Research and Practice of Collaborative Development between Teachers and Students

Teachers and students are two cores of AI talents cultivation, required of sustainable growth aiming at their own problems and development goals. At the same time, it is needed of positive effects of platform environment, incentive mechanism, learning atmosphere, teamwork, teaching methods and integration of profession and innovation for realizing collaborative development between teachers and students, which can form the closed loop of talents cultivation system and gain better effectiveness.

### 5.1 Collaborative construction of co-creation platform for teachers and students

In view of the necessity of co-creation platform for teachers and students, we established the research center of AI application innovation while AI major was done, which is a platform of teaching, scientific research, competition, practice and entrepreneurship by teachers and students [10]. Under the support of college of innovation and entrepreneurship education, the research center consists of teachers' workshop and students' one, Teams consist of teachers and students coming from teaching and research offices of artificial intelligence, computer science and technology, data science and big data technology and economic statistics, and student teams quotas were confirmed by field capacity, it is showed as Fig. 3. At the same time, the road of enterprise oriented operation is executed in terms of different major directions and industrial characteristics. After continuous reform and development, the framework of research center evolved from single organization of teachers plus students to seven operating departments of teams mode of tutors plus students, and will be dynamically adjusted by

situation of AI industrial and actual business development, it is showed as Fig. 4.

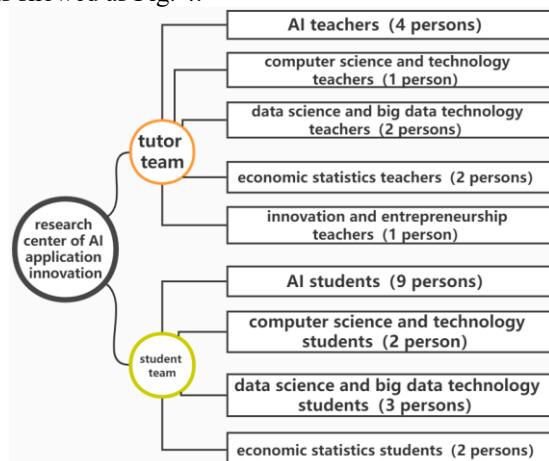


Figure 3. Team composition of research center.

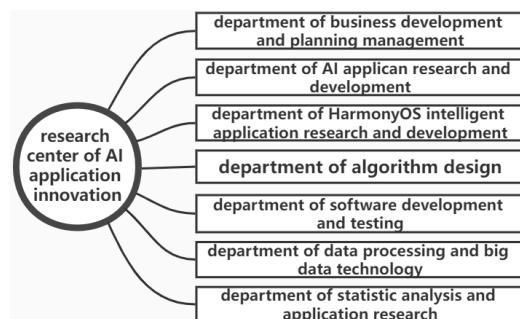


Figure 4. Organizational structure of research center.

The favourable educational environment can be builded for teachers and students by construction of platform, which can be used to carry out activities of education and teaching, scientific research innovation, competition cooperation, or integration of profession and innovation. The close influence is the basis of collaborative development between teachers and students.

## 5.2 Selection mechanism of teams of teachers and students

- Members of selection for tutor team. Tutors of Research Center are selected according to overall thinking of cross fusion, that is, excellent tutors of inside and outside the school should be introduce in terms of business development needs and division changes. The present ten tutors come from four teaching and research offices of big data college, college of innovation and entrepreneurship education and china university of petroleum, and next step will be stage by stage expand to ones of other secondary schools, which can realize tutor team of “AI plus” cross fusion. At the same time, the introduced tutors should approve the idea of technical

innovation, study guide, OBE teaching, integration of profession and innovation and win-win cooperation, and be willing to become developer oriented teachers.

- Members of selection for student team. It should be mainly considered of knowledge base, learning initiative, technological potential and cooperative spirit of group. The selection modes undergoed from collective selection, key selection of different majors to cultivating selection according to business development needness. At the same time, individual students will be dynamically selected to team through professional interviews when he or she has excellent technology specialty. At present, the team selection based on project-oriented mechanism is trialing reform for promoting mobility and competitiveness. It is showed as TABLE I

TABLE I. MEMBERS OF SELECTION MECHANISM FOR STUDENT TEAM

| Selection Mode             | Implementation Method  | Specific Process  |
|----------------------------|--|---|
| collective selection       | take example by enterprise recruitment process, and carry out selection through unified registration, collective written test, technical interviews.   | 35 students applied in 68 ones of 2020 class of AI major, and 7 ones were accepted. The acceptance rate was 20%.  |
| key selection              | according to business directions, the way of submitting resume is used to select from different majors.  | 56 students coming from two classes and four majors, and 9 ones are accepted through resume screening and comprehensive interviews. The acceptance rate was 16.1%.  |
| cultivating selection      | confirm departments and quotas, and create atmosphere and admit the best examinee through joining interest group, improvement of professional level and technological competition before official selection. | AI development team and HarmonyOS applied development team were established, and 15 students and 32 ones severally join them. Three students were accepted after self-directed learning and technological competition. The acceptance rate was 6.38%. |
| dynamic selection          | individual students will be dynamically selected to team through professional interviews when he or she has excellent technology specialty.  | a student had outstanding performance in several competitions, and another one gained the provincial first prize of high level competition, so they were accepted.  |
| project-oriented selection | check and select according to students' comprehensive abilities, competition performance and teachers' recommendation, and work period is set to promote mobility and competitiveness.                       | trial reform.   |

In practice, these selection ways can be chose flexibly to confirm that students of high learning motivation, good professional foundation, being interested in AI technology can join the teams of research center. Besides, the selection mode of student teams can change from one-way selection of teachers to students review recommendation and teachers checks, and student team member can change from candidate to parental developer and recruiter.

## 5.3 Diversified Learning Drive

The increase of student's learning initiative can't be attain by teachers' requirement or several single methods, but many ways are used to influence students synthetically [11-12].

**5.3.1 Construct learning community of university-industry cooperation:** To change the default, Under the cooperation with Baidu and Huawei, PaddlePaddle pilot group of Qingdao Huanghai University and Harmony learning community were established to attract students being interesting in AI technology and creat favourable learning and exchange atmosphere. At the same time, based on resource of curriculums, technical services and computing power, students can promote their technical level and understanding of industrial practices.

**5.3.2 Build a competition team:** Depending on members of research center, every student take charge of a competition team and guide team members to promote technical ability and exert strengths. All of them take part

in competitions collectively and promote the overall technical level.

**5.3.3 Establish a development interest team:** Depending on multiplex mode AI development kit of Huawei Hilens and Atlas 200DK development kit, we established a AI development interest team to study hardware and software application development. Advancing with the IOT development trend, we established HarmonyOS application interest team to study IOT application development based on Huawei DevEco Studio distributed application development platform and developer resources.

**5.3.4 Encourage inter-school exchanges:** Encourage students to communicate with extramural supervisor actively, and learn advanced experiences of first-rate universities.

**5.3.5 Normalization academic exchange of teachers and students:** Generally, teachers are principle part in academic exchange forum organized by universities. However, we organized cross fusion forum of students to stimulate more students to learn from advanced individuals. From organization of the event, students actively signed up, there were no empty seats in lecture hall, and the result was very favourable. Excellent students' knowledge summary and lecture ability were honed through this kind of activities, and their self-confidence was enhanced, which brought good experiences and stimulated other ones' fighting will.

So, it is a diversified influence process to promote students' overall learning initiative. Based on concerted effort of tutors and students in research center, the process can be progressively realized, and more and more students can be motivated to study AI technology. It is showed as Fig. 5.

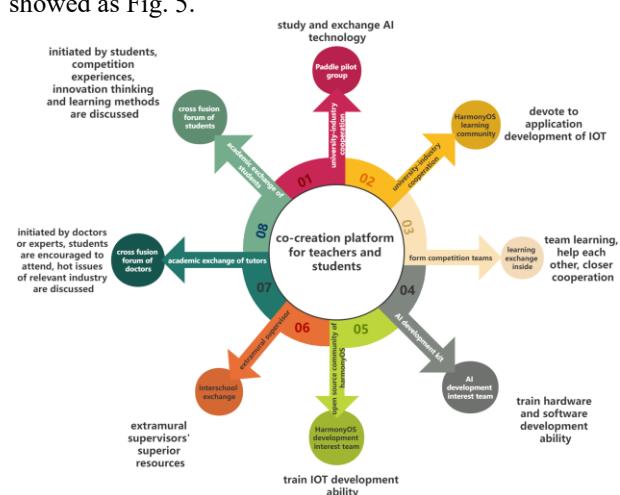


Figure 5. Diversified learning drive process.

#### 5.4 Build a teaching team of teachers and students

Teaching is the important process of professional ability growth of teachers and students. However, students only coordinate teachers to study in conventional teaching, and teachers put a lot of effort into reviewing homework in AI courses of many experiment links, which compress research time of related knowledge points. Our AI lab established based on Baidu AI open platform, and AI Studio platform was used as platform of teaching, learning and practical learning in the course of fundamentals of machine learning. We selected several excellent students from team as teaching assistants, and optimize course management and learning result through cooperation of teachers and students. Teachers take charge of plan, organization and implementation of the whole course teaching, and teaching assistants of students help teachers to review programming homeworks, publish results, organize discussion and answer questions. Through the method of cooperation teaching of teachers and students, the first is that teachers can gain more time to teaching research and make course better, the second is that students acting as teaching assistants study actively course knowledge and understand deeper, the third is that efficiency of answering question is enhanced, and the fourth is that more chances of learning exchange can be gained for the whole class.

#### 5.5 Ability development driven by integration of profession and innovation

As for students of application-oriented undergraduate universities, they can gain some professional competition awards by working hard, but it is very difficult to make them get acute industrial insight and solve some key problems of industrial practices, and truly high-quality projects having economic potential. So, teachers still play a leading role and students a supporting role in integration of profession and innovation education of application-oriented undergraduate universities [13]. Developer oriented teacher should have an insight into industrial requirements, apply related AI technologies to solve industrial problems, and get chances of projects with enterprises. At the same time, some students will be selected to participate in project research based on project needs, which can realize coordinated development of teachers and students. In the process of project research, high-quality business projects can be find, and teachers and students can start a business together.

### 6 Conclusions

With the development of artificial intelligence, AI talents cultivation is the field studied relatively much more in recent years, but teachers are usually considered eligible in the overall talents cultivation system, and it is important for students to carry out reform of teaching system and methods. However, the truly eligible AI teachers are not common because of quick development of AI technology and lack of related talents, and many

teachers engaged in related teaching are promoting themselves. As for students of application-oriented undergraduate universities, application and experiences are the most required ability to accumulate and promote. So, we propose some feasible advices based on existing exploration and practices to cultivate AI talents of holding industrial thinking, abundant theoretical knowledge and strong applied ability.

- One-way thinking placed emphasis on cultivating students should be changed, and teachers and students should be brought into AI talents cultivation system together. Efforts to develop of AI teachers should be enhanced, and teachers should be guided to solidify the foundation of Mathematics, study AI theories deeply and accumulate project practice experiences.

- In the aspect of teachers' growth target, the characteristic of integration of industry and education should be highlighted according to industrial development trend, which can make teachers of traditional teaching style to developer oriented teacher.

- Based on hard working teachers of related majors, co-creation platform for teachers and students should be established in terms of mode of integration of profession and innovation. Excellent students of related majors could be selected to join the team, and top students could be cultivated by elite and inclusive mode to accumulate practice experiences and increase applied ability. At the same time, these excellent students could drive other ones to make progress together.

- The leading role of developer oriented teacher should be played in education of integration of profession and innovation, which can benefit to give full play to excellent students and explore quality entrepreneurial projects.

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