TAL “Using AI Language Teaching System to Innovate Language Learning of Under-Resourced Students” Programme

Progressive Evaluation Report

Beijing Normal University

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Evaluation Report on the TAL "Using AI Language Teaching System to Innovate Language Learning of Under-Resourced Students" Programme

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Part 1 Background for Evaluation

I. Purpose of Evaluation

Bilingual learning is of great significance for children of ethnic minorities to learn their mother languages. As pointed out by Professor Luo Qingchun at the School of Yi Studies, Southwest Minzu University, "On the one hand, if the importance of mother language learning is neglected, it will diminish at an astonishing speed; on the other hand, since Mandarin is the national common language, learning Mandarin is very important for children to attend school or work away from home... Therefore, in the Yi region, it is a realistic and scientific approach to attach equal importance to both the Yi language and Mandarin." [2]For the Yi people in Liangshan, bilingual education is aimed at two aspects. On the one hand, through learning the Yi language and culture, the young people of Yi nationality are expected to master their own ethnic language and culture and become inheritors of their excellent ethnic cultural legacy. On the other hand, Mandarin is a tool and necessary condition for them to enter the mainstream society. Learning both languages well may contribute to the full

[1]The evaluation team consists of post-doctoral fellow Wang Xiaoyan at Beijing Normal University, Dr. Su Sanyou at Chengdu University of Technology, and Mou Yunjuan at Sichuan Academy of Social Sciences. We hereby extend our gratitude particularly to Ms. Tang Xueli for her coordination work during the field survey and research process. Ms. Tang Xueli and Ms. Qin Luxiao also provided lots of background information and important insights for this evaluation. This report was written by Wang Xiaoyan.

[2]Cited from an interview with Professor Luo Qingchun, a scholar from the School of Yi Studies, Southwest Minzu University.

development and progress of individuals, thus promoting the development of the Yi region.[3] According to the survey, since the founding of the People's Republic of China, governments at all levels have issued many policies to promote bilingual learning, and achieved certain success in bilingual education in the Yi region. Due to some objective reasons, however, the efficacy of bilingual learning for children in the Yi region is not completely satisfactory.

In this context, the "AI Teaching Smart Education" programme (hereinafter referred to as "AI Teacher") aims to address Yi children's needs for bilingual learning, a problem plaguing the economic and social development of the Yi region. In June 2018, a TAL team went to Zhaojue County, Liangshan Yi Autonomous Prefecture, Sichuan Province for a survey, through which the course R&D team learned about the basic conditions and needs of local education. For Yi children living in the mountains, being unable to speak Mandarin is the biggest obstacle for them to communicate with the outside world. From June to August 2018, based on the existing self-developed AI technology, TAL designed an AI language teaching system to meet the specific needs of students in ethnic minority areas for Mandarin learning. As public media reports, this is the first time that AI technology has been applied in mandarin teaching in ethnic minority areas in China, and it is also the first time that AI technology has been applied in public welfare projects. According to the specific Mandarin learning needs of students in ethnic minority areas, the system, with the support of AI, performs bilingual teaching of the Yi language and Mandarin, and helps preschool and primary school children in Zhaojue County solve the problems encountered in bilingual learning. As of September 19, 2019, the programme has covered 252 teaching points[4] and 72 primary schools in 47 townships in Zhaojue County. The programme benefited 2,417 teachers (including 1,188 female teachers, accounting for 49.2%) and 70,462

[3]Teng Xing. (2000). The Necessity of Implementing Yi-Chinese Bilingual Education at Liangshan Yi Community Schools. *Journal of Research on Education for Ethnic Minorities* (1), 5-25.

[4]In some extremely remote areas, there are some small schools which are located not even in villages but in mountains, and these schools may have only a dozen or even less children. They may be in different grades, but all study in the same class. At small teaching points, there is usually only one teacher, who teaches multiple subjects such as Chinese and mathematics. Teaching units like this are called "teaching points".

students (including 28,981 female students, accounting for 41.1%).[5]

To summarize the experience and lessons from the "AI Teacher" programme in the past year (September 2018 - September 2019) and further expand the application of educational informatization programmes in remote ethnic minority areas, TAL engaged experts who are experienced in educational informatization research and practice to research and analyze the operating status of the pilot programme from August to September 2019, with a view to:

1. Checking whether the programme has achieved the expected objective;
2. Analyzing the programme from the perspectives of innovative design concept, solutions to problems, and innovation in mechanism and system;
3. Evaluating the main output and impact of the programme, identifying programme experience, and appraising the relevance of the programme by using a result-centered framework;
4. Putting forward suggestions for future development of the "AI Teacher" programme on the basis of evaluating the needs of local children and teachers, and in line with the future planning of the programme.

II. Design of Evaluation Content and Method

1. Design of evaluation content

The content of evaluation mainly includes:

(1) Review of the programme objective and evaluation of the achievements: What is the objective of the programme? What is the educational problem to be solved? Has the programme objective been achieved?

(2) What educational concepts are mainly adopted in the programme design process? What solution is used? Is there any innovation in the mechanism and system?

(3) Main results and experience from the programme: What are the results of the programme? What reproducible experience has the programme created? (Are school

[5]Refer to the *Statistics on the Usage of the TAL "AI Teacher" Mandarin Teaching System* provided by the Education, Sports and Technology Bureau of Zhaojue County.

teachers, children and local personnel involved in the curriculum design process?)

(4) Main lessons and limitations drawn from the programme: What are the main lessons from the programme? What factors constitute these limitations? Can these limitations be overcome in the future? Is the programme sustainable?

(5) The idea is to, through the analysis of the objective, concept, solution, main experience and lessons of the programme, puts forward specific suggestions on how to develop informatized education products in the future, and evaluate the feasibility of the programme.

2. Evaluation methods

The evaluation methods mainly include:

(1) Literature analysis. The content of literature analysis includes the content of "AI Teacher" courses and relevant programme materials.

(2) Questionnaire survey: The questionnaires are distributed to 2,417 teachers from 252 preschool teaching points and 72 primary schools that use the "AI Teacher" Mandarin teaching system with a view to surveying the local usage of the system.

(3) Focus group interviews with students, parents and teachers from schools where the programme is implemented, and personnel from the local education authorities.

(4) Personal interviews with programme managers and contact persons of the local education authorities.

(5) Local Chinese examinations for first-grade students.

3. Evaluation samples

Since the TAL "AI Teacher" system was introduced to Zhaojue County, Sichuan Province from September 2018, it has covered 252 preschool teaching points and 72 primary schools by September 19, 2019. Considering the characteristics of the programme schools and factors such as road conditions and following the advice of local teachers and TAL programme staff, the programme evaluation team chose nine schools in Zhaojue County as objects of the field survey. They are Minzu Primary School, Dongfanghong Primary School, Sanchahe Township Central School, Huopu Village Kindergarten, Wanda Central School, Sikai Township Central School, Jiefang Township

Central School, Tekou Jiagugu Central School, and Zhuhe Central School.

III. Evaluation Implementation

In June 2019, through consultation with TAL, the evaluation team decided to carry out the evaluation in three phases. The first phase was the preparation phase from June to August. In this phase, the primary work was to collate materials, carry out literature analysis of the courses and related materials in the “AI Teacher” system, and prepare self-evaluation forms for programme implementers, survey plans, questionnaires, and interview outlines.

The second phase is the field survey phase. From September 1 to 10, 2019, the three-member survey team carried out a field survey successively at Minzu Primary School, Dongfanghong Primary School, Sanchahe Township Central School, Huopu Village Kindergarten, Wanda Central School, Sikai Township Central School, Jiefang Township Central School, Tekou Jiagugu Central School, and Zhuhe Central School. They conducted 226 interviews, including 16 self-evaluation interviews, focus group interviews with 120 students, and interviews with 90 teachers and parents.

The third phase was from September 11 to October 10. The work mainly included collating interview materials and writing and discussing evaluation reports.

Part II Main Findings and Conclusion of the Survey

I. Programme Review: Implementation Process of the "AI Teacher" Programme

1. System deployment and training for teachers

In March 2018, the Education, Sports and Technology Bureau of Zhaojue County launched the "Preschool Mandarin Learning" programme. TAL's "AI Teacher" system could exactly contribute to this educational goal. The system has a specially customized Yi-Chinese bilingual learning module for preschool Yi children, which integrates speech recognition, speech evaluation and other technologies. The module may intelligently evaluate and correct children's pronunciation in real time, helping them learn both Mandarin and the Yi language. In September 2018, local deployment of the system was completed, and the first system use training was conducted for the first batch of local teacher trainers. The training included instructions for use of the "AI Teacher" system, teaching instructions, etc. In the following year, the local education bureau organized the teacher trainers to train 2,417 teachers in batches. By taking part in the programme training, the teachers developed a better understanding of the programme. As the system was convenient and easy to use, the teachers digested the training content very easily and quickly mastered the system.

2. Local teachers and students participated in the development of localized language teaching resources

In the process of developing teaching resources, the programme team, together with the local education bureau and the Language Working commission, combed through the local common vocabulary and invited the local teachers in Zhaojue County to draw relevant illustrations and record Yi-Chinese bilingual audio files. During the AI system development process, the local Yi children were also invited to contribute their

voice in order for the system train and enhance its voice recognition function. The daily life scenarios and some articles of everyday use displayed in the system were all shot based on the daily life of the local people. Besides, for schoolyard scenarios, children and teachers from local kindergartens were invited to take part in the shooting process.

3. Tests for students

In September 2019, after the system was used for a year, a Chinese language test was given to the first-grade students enrolled in 2018 to evaluate their Mandarin proficiency before and after the system was used, based on data comparison. At the same time, a Chinese language test was also given to the first-grade students enrolled in 2019 who had received preschool bilingual education at kindergartens, and the test data were compared with the data of the Chinese language test for the students enrolled in 2018 who had not participated in the bilingual learning.

II. Content of Programme Evaluation

1. Programme objectives and achievement (educational issues to be addressed by the programme)

Zhaojue County belongs to Liangshan Yi Autonomous Prefecture in Sichuan Province and is located in the southwest of Sichuan Province. Over the years, Zhaojue County has suffered a relatively backward economy due to the geographical and environmental factors. It is not only the county with the largest Yi population in China, but also a poverty-stricken area, as well as a key target of the national effort for poverty alleviation. In Zhaojue County, the popularization rate of Mandarin is extremely low and the local people are unable to communicate and integrate with the outside world. This has become a major obstacle to the local education and economic development, as well as an obstacle for the Yi compatriots in lifelong learning.

The main educational problems faced by Zhaojue County include: (1) Yi people account for 98.1% of its total population, their Mandarin proficiency is low, and they lack a Mandarin-using environment. Even if children have the opportunity to learn

Mandarin at kindergarten and school, they still use the Yi language to communicate at home. Without the conditions and environment to practice Mandarin, it is difficult for them to achieve good bilingual learning effects. In fact, Zhaojue County is a microcosm of the entire Liangshan region. 49% of the 540,000 preschool children in the region cannot speak Mandarin. Providing Mandarin education and promoting bilingual education have become one of the most formidable tasks in the development of the Liangshan region. (2) Children whose mother tongue is the Yi language did not receive bilingual training at the preschool education stage (which is also the most critical stage for language learning), and could not catch up after entering primary school. This has resulted in a massive loss of bilingual students. It is also one of the reasons for the high drop-out rate of Yi students from primary school. According to the survey, most of the children who did not learn Mandarin effectively before attending school may not master Mandarin gradually until they reach the third grade. This greatly hinders their learning of other subjects at school. (3) There is a shortage of competent bilingual teachers in the local region. According to the survey, teachers at kindergartens and schools have limited proficiency in Mandarin and cannot teach or evaluate Mandarin effectively. This is attributed to the shortage of bilingual teachers. From primary schools to high schools, most teachers in Liangshan Yi Autonomous Prefecture come from Xichang University and Southwest Minzu University. However, the two universities enroll only a limited number of students majoring in education each year and thus can hardly train enough bilingual teachers. As for bilingual graduates from colleges and universities, it is difficult to pass the teacher qualification examination as they lack a relevant educational background. In addition, as other sectors of the local region also need a large number of bilingual professionals, bilingual teachers are often "intercepted". Besides, as teachers are not paid well, few bilingual professionals would choose educational occupations. It is safe to say that there is a severe shortage of bilingual teachers to meet the educational needs.[6] (4) The big-class teaching mode (more than 30 students in one class) makes it impossible for teachers to give

[6]Chai Yuan. (2018). Current Situation and Challenges of Yi-Chinese Bilingual Education in Liangshan Prefecture - From the Perspective of Policy Evolution and Implementation. *Ethnic Education of China*, 231 (10), 46-49.

personalized tutoring to each student. In Zhaojue County, a typical class at the preschool teaching point consists of 2 teachers and 30 students, while a typical class at the primary school consists of 1 teacher and 50 students. Given such a teacher-student ratio, it is difficult for teachers to give timely one-on-one guidance to students. (5) As the traditional Mandarin teaching materials (pictures and related content) are drawn from the general content of the Han nationality, there is a lack of learning materials integrated with the local conditions. This leads to a shortage of life experience to support the learning content, thus making it difficult to arouse students' learning interest. (6) The local region is extremely impoverished and cannot afford the expensive infrastructure and hardware and software for educational informatization. These objective problems have affected the bilingual learning effect of Yi children.

The "AI Teacher" programme was officially implemented in September 2018. Its overall goal is to "help Yi children in bilingual learning through technology and high-quality teaching resources". In view of the above-mentioned educational problems faced by the Yi region, the "AI Teacher" programme is aimed at: (1) improving the quality of common language learning for the ethnic students, including the use of "AI Teacher" for personalized learning; (2) narrowing the digital divide by low-cost methods and promoting educational equity.[7]

In the evaluation process, questionnaires were distributed to 2,417 teachers from 252 preschool teaching points and 72 primary schools that use the "AI Teacher" Mandarin teaching system with a view to surveying the local usage of the system, and 847 valid questionnaires were collected. The evaluation team analyzed the data and objectives. The first objective is to provide a new learning method for students, the main interest group involved in teaching, improve the quality and efficiency of their bilingual learning and realize personalized learning. According to the data, this objective has been achieved to a certain extent. Data shows that after the students participated in the programme, they could master more Chinese words in a week. Before using "AI Teacher", only 14.59% of the students could master more than 8

[7]Excerpt from *White Paper on Internet-based Learning* by TAL Online School

Chinese words in a week, while after using “AI Teacher”, 41.62% of the students could master more than 8 Chinese words in a week.

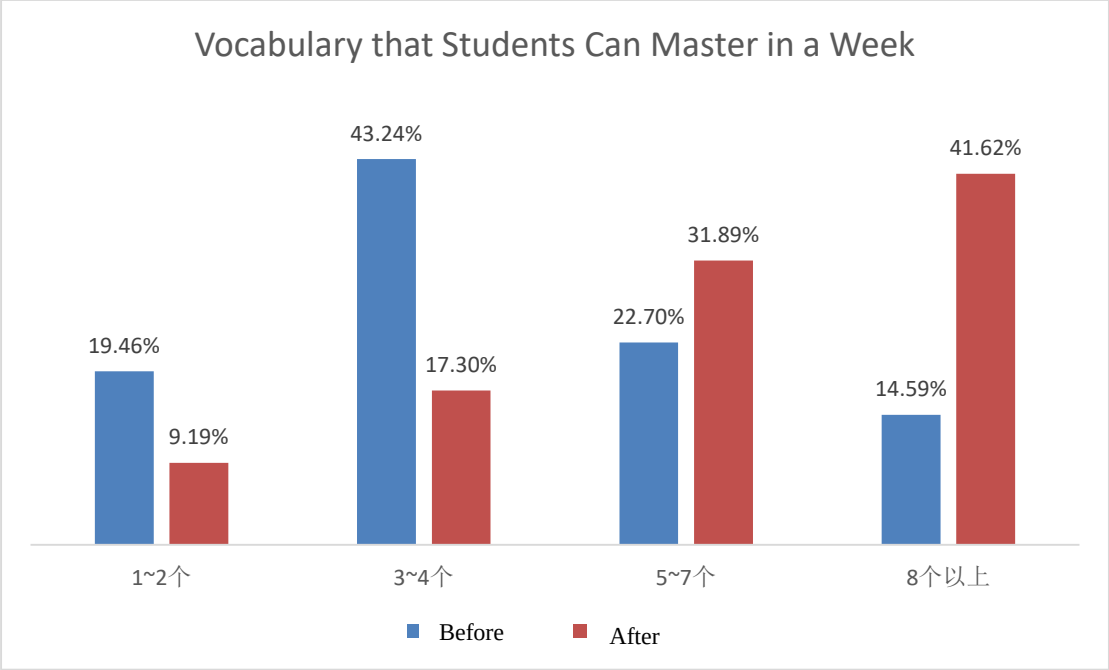


Fig. 1 Vocabulary that Students Can Master in a Week

The questionnaire survey also shows that “AI Teacher” also improved teachers’ teaching efficiency. Before using “AI Teacher”, 90.27% of the teachers needed to help students correct their Mandarin pronunciation in class. After using “AI Teacher”, only 54.05% of the teachers needed to help students correct their pronunciation. In addition, since 54.05% of the teachers still needed to help the students correct their pronunciation, they did not rely entirely on the “AI Teacher” system for teaching, but provided personalized tutoring for students according to their individual learning status. The teachers also talked about this in interviews.

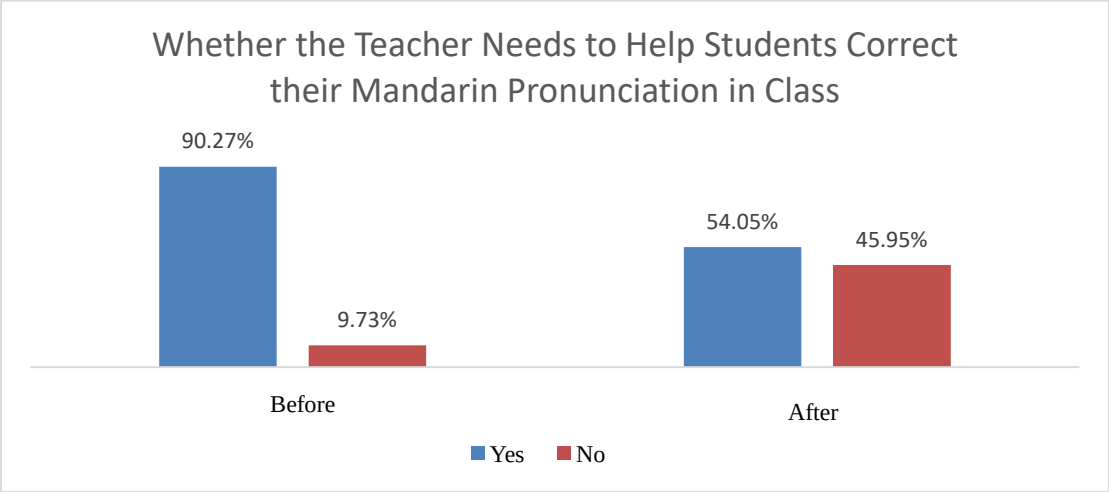


Fig. 2 Proportion of Teachers Who Need to Help Students Correct Mandarin Pronunciation

Before using "AI Teacher", 84% of the teachers needed to spend more than 5 minutes in a 40-minute class correcting their students' pronunciation, of which 59.46% needed to spend 5-10 minutes; after using "AI Teacher", only 21.62% of the teachers needed to spend 5-10 minutes correcting pronunciation, while 66.49% of the teachers needed to spend less than 5 minutes.

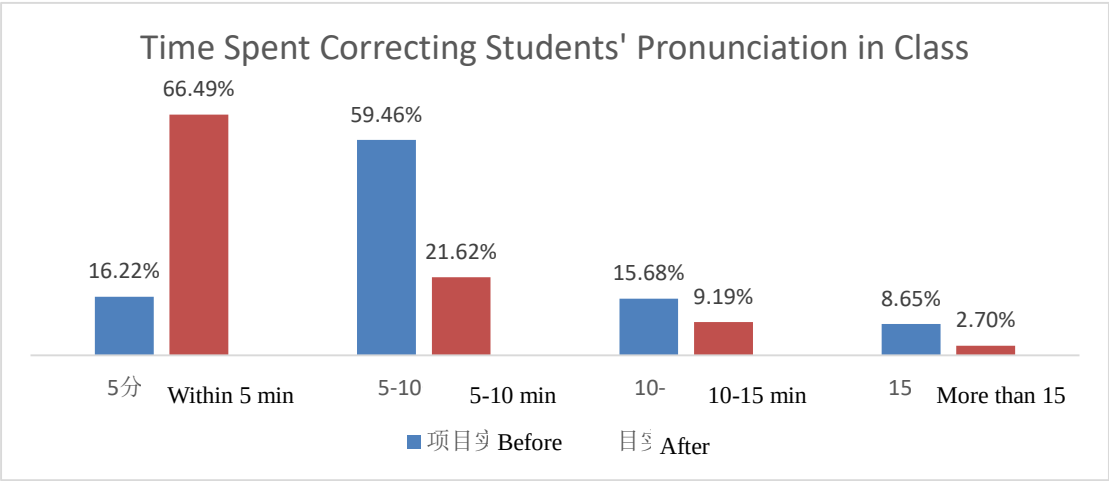


Fig. 3 Comparison of Time Spent Correcting Pronunciation in Class

These data show that, after using "AI Teacher", teachers felt "more relaxed" in class, and both the teaching efficiency and quality were improved. Besides, they saved a lot of time, so that they have time to "inspect students' learning status" and "tutor

individual students". For students, the "AI Teacher" improved their learning efficiency and enabled them to quickly learn the lesson and use the saved time to acquire new knowledge. For example, they had a lot of time for extracurricular reading. Besides, due to increased confidence, they had the courage to have daily dialogues in Mandarin. Many teachers said that they had learned a lot of new teaching methods through the "AI Teacher" programme. Using the "AI Teacher" system, students mastered a large vocabulary. Besides, this also promoted the communication between students and other teachers who do not speak the Yi language. And surprisingly, although these courses were designed for kindergarten and primary school students, they also helped teachers improve their teaching in Mandarin.

Local teachers and students were also invited to participate in the implementation of the programme. They put forward many suggestions for the improvement of the system, e.g. "the programme should adapt to the local conditions", "Mandarin contests should be organized at kindergartens" and "the programme should win the support of parents". All these suggestions were adopted to a certain extent. These suggestions have proved to be very helpful for the "AI Teacher" programme to integrate into the local region and aroused the local children's interest in learning through the "AI Teacher". Besides, parents' support also promoted the implementation of the programme.

The second goal is actually to promote educational equity, that is, to narrow the digital divide in areas with insufficient resources and achieve inclusive and fair education of high quality. Specifically, the idea is to use "AI Teacher", a low-cost and low-network-requirement solution, to give more schools access to such resources. According to the survey, this goal has been partially achieved as well. The reason for defining the goal as being "partially achieved" is that it will take a longer time to see the long-term effect of the programme, especially its impact on local education and economic and social development, which needs to be further observed and evaluated over time.

2. Programme design concept

The design of “AI Teacher” was based on the concept of promoting educational equality. It can be seen that this concept runs through the programme from the perspectives of the problems that the programme is intended to solve, the programme solutions, as well as the implementation strategy. The system used in the “AI Teacher” programme comes from the AI education system of TAL online school. The “lecturer + tutor” live broadcast mode adopted by TAL online school has produced remarkable learning effects in practical application. It integrates AI technologies such as voice recognition and evaluation independently developed by TAL online school as auxiliary teaching means, and performs teaching functions such as in-class testing, real-time interaction, voice evaluation, and timely Q&A.[8] The AI technology adopted in the programme accepts the training of voice data from 300 to 400 million primary and middle school students, so the accuracy of children's voice recognition can reach 93%. The application of AI technology not only makes the class more lively and interesting and fully arouses children’s interest in learning, but also breaks through the restrictions of time and space and the economic and cultural barriers, giving every child access to quality education and making online learning more effective. By applying AI to the classroom, innovations are introduced to the teaching and learning methods and students are given access to not only better quality resources, but also personalized guidance. According to the survey, this system has been very mature at TAL online school. The local education authorities hope this system can be applied to Yi-Chinese bilingual learning for local children, thereby improving the local education level.

3. Innovations of the programme in system and mechanism: innovative cooperation mechanism

The innovative cooperation mechanism has promoted the implementation of the programme in Zhaojue County. Through cooperation with the local teachers, education authorities and the Language Working Commission, TAL has promoted the

[8] *White Paper on Internet-based Learning* by TAL Online School

localization of the programme, adapted the learning materials to the local conditions, and prevented the adverse effect of top-down implementation of the programme. Such a way of cooperation on the R&D of educational programmes has provided a copyable example for the R&D of other educational products.

In addition, the programme also received support from the local government. The programme was implemented in coordination with the educational activities launched by the local education authorities as well as the national policy of “poverty alleviation through education”. The local education authorities and schools provided policy support for the implementation and sustainable development of the programme. For example, the local government provided corresponding poverty alleviation fund to ensure the financial sustainability of the programme. Headmasters were also actively engaged in the promotion of the programme. Such institutional support promoted the further implementation and sustainable development of the programme.

III. Main Achievements and Experience of the “AI Teacher” Programme

1. Main achievements

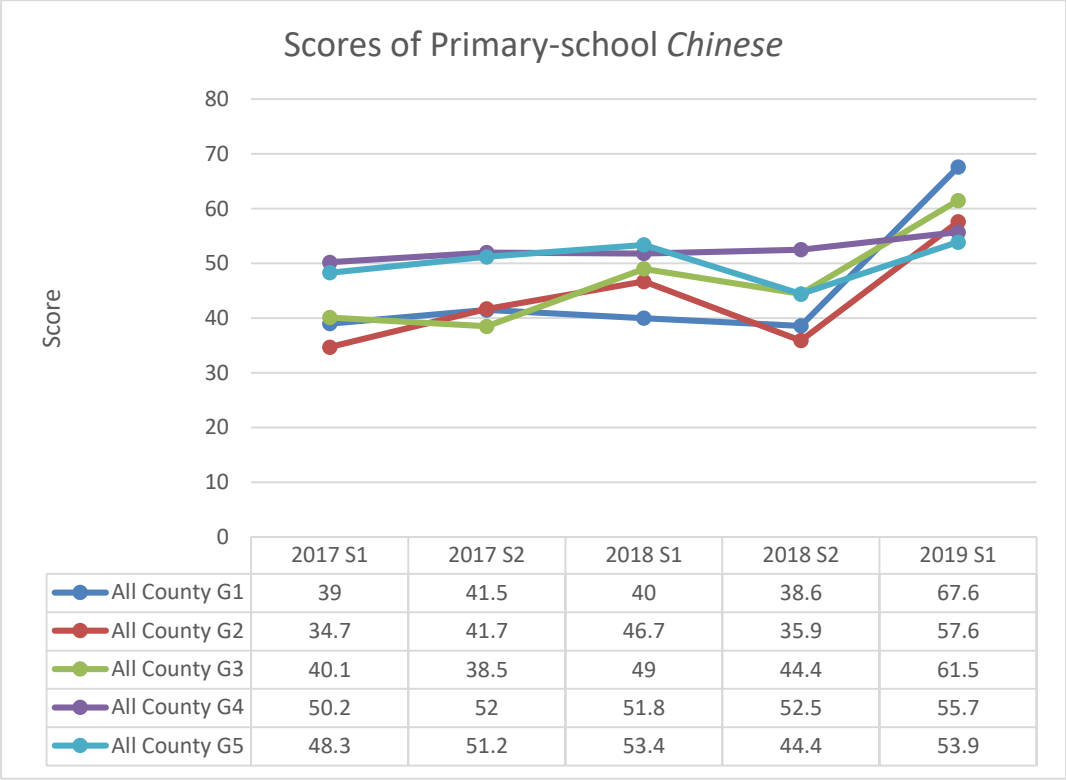
As of September 19, 2019, the programme has covered 252 teaching points and 72 primary schools in 47 townships in Zhaojue County. The programme benefited 2,417 teachers (including 1,188 female teachers, accounting for 49.2%) and 70,462 students (including 28,981 female students, accounting for 41.1%). At present, the developed content of the programme has covered all Chinese language courses from preschool Yi-Mandarin bilingual teaching to Grade 6 of primary school.

The programme achievements are mainly evaluated through questionnaire survey among students and teachers, interviews with students, teachers and parents, and Chinese tests.

(1) Impact on students

97% of the teachers believe that the system has boosted students' confidence to speak Mandarin, 97% believe the system has enlarged students' Mandarin vocabulary, and 96% believe the system has increased the accuracy of students' Mandarin comprehension; 91% believe the system has improved students' Mandarin writing (and Chinese character writing) skills; 93% believe the system has improved students' Chinese scores, and 89% believe the system has improved students' scores in other subjects. "There are currently 7 teaching points in Sanchahe, where 219 children are engaged in bilingual learning as required. 'AI Teacher' is an important tool for them to learn Mandarin," commented by a teacher named Shourelage. "In the past, the local children skipped kindergarten and attended primary school directly, because they could not follow Mandarin teaching. And it was very difficult to teach them Chinese characters directly and improve their performance," he said, "Through preschool Mandarin education, now they not only understand everyday Mandarin, but also get a lot better at writing. The system may improve the teaching quality of the nine-year compulsory education by two or three times."

During the survey, the data of students' Chinese test scores were also collected, as shown in the following figure:



	2017 S1	2017 S2	2018 S1	2018 S2	2019 S1
All County G1	39	41.5	40	38.6	67.6
All County G2	34.7	41.7	46.7	35.9	57.6
All County G3	40.1	38.5	49	44.4	61.5
All County G4	50.2	52	51.8	52.5	55.7
All County G5	48.3	51.2	53.4	44.4	53.9

Fig. 7 Students' Scores of Chinese Tests

It can be seen from the data that the earlier the AI language teaching system is introduced, the faster the children will improve their Mandarin learning effect. The first-grade students enrolled in 2019 who used the "AI Teacher" system achieved an average score of 67.6 in Chinese last semester, which was far better than the average scores achieved by the first-grade students enrolled in 2018 (40) and the first-grade students enrolled in 2017 (39) who did not use the system to learn Mandarin before school.

During the survey, we also conducted questionnaire surveys, focus group interviews and personal interviews with the students. The data show that the "AI Teacher" system has helped more than 95% of the students make remarkable progress in Mandarin listening, speaking, reading and writing. The data also shows that 97% of the students have been able to communicate with the outside world more confidently and smoothly. In addition, more than 96% of the students have become more interested in learning Mandarin thanks to "AI Teacher". Moreover, 93% of the students have improved their Chinese scores thanks to the use of "AI Teacher", and more than 89% of the students even indirectly improved their performance in other subjects

thanks to their better learning ability acquired through improved language proficiency.

(2) Impact on teachers

A questionnaire survey was also conducted among 2,417 teachers (who are users of the system) from 252 preschool teaching points and 72 primary schools, and 847 valid questionnaires were collected.

According to the survey, more than 89% of the teachers believe that the "AI Teacher" system has significantly reduced their working hours and improved their working efficiency; 94% of the teachers have been able to communicate with the outside world more confidently and smoothly; 96% of the teachers believe that the system has helped them pronounce Mandarin more accurately and significantly enlarged their vocabulary; 95% of the teachers believe that they have been more confident about teaching with the help of the system.

With the support of AI technology, the teachers have adjusted their teaching methods, and the new teaching methods have improved their educational efficiency and quality. "All our teachers have installed the 'AI Teacher' app and many of them would follow the system to learn Mandarin," said a teacher named Erluomuguo: "Personally, I think 'AI Teacher' has been very helpful for me to improve my Mandarin." "At the beginning, the 'AI Teacher' would score no more than 70 points for my Mandarin pronunciation," he continued, "By repeatedly observing Mandarin texts and reading after the system, now I can score about 80 points." "Since last September, the children have been using 'AI Teacher' for nearly two semesters. I found that their accuracy and ability of expression in Mandarin have improved obviously," said Erguwuha, a fourth-grade teacher at Sancha Township Central School, "In the past, when children entered the third or fourth grade and began to learn three-dimensional graphics, their performance would decline. This is because a lot of knowledge points need to be explained in relatively complicated Chinese, and some of them could not be understood. But for students enrolled this year, their performance didn't decline much, so I believe the system is very helpful to children's learning."

One of the purposes of developing the system is to assist teachers with some repetitive work, instead of replacing them. From this perspective, “AI Teacher” empowers teachers and enables them to focus on the personalized needs of the students.

(3) Feedback from parents

This way of bilingual learning using new technologies is much welcomed by parents. As mentioned by a parent in the focus group interview, “As a parent, I think preschool Mandarin learning is necessary. After all, every child has to attend school and go out to study in the future, so they need to learn Mandarin.” Earlier, from the survey of the Yi community in Liangshan conducted by Professor Teng Xing of Minzu University of China, we also learned that the vast majority of Yi teachers in Liangshan do not want Liangshan to be a monolingual society with either the Yi language or the Chinese language, but hope it will become a bilingual society with both languages, and they strongly agree with the bilingual education of both languages. Professor Teng Xing believes that the view of Yi teachers can basically reflect the view of the local students and their parents in an objective manner. Therefore, the general consensus of social attitudes has laid the social foundation for Yi-Chinese bilingual education at the schools in Liangshan Yi Autonomous Region.[9]

(4) Feedback from local education authorities

During the interviews with the local education authorities, we learned that the new teaching tool has made Mandarin teaching more consistent and standardized, become an assistant for the teachers, and promoted the reform of the local teaching and learning methods. Jiseyipo, head of the Electronic Education Station, the Education, Sports and Technology Bureau of Zhaojue County, commented as follows: “The level of Mandarin proficiency among our teachers is uneven, so is the case among

[9]Teng Xing. (2000). The Necessity of Implementing Yi-Chinese Bilingual Education at Liangshan Yi Community Schools. *Journal of Research on Education for Ethnic Minorities.* (1), 5-25.

their students. The ‘AI Teacher’ is like a consistent and standardized Mandarin teacher to assist our teachers’ Mandarin teaching. The most important function of ‘AI Teacher’ is to correct the teachers’ pronunciation errors. This is because the built-in articles in ‘AI Teacher’ are matched with the Chinese textbooks. Before the Chinese class, students can listen to the lesson first and during the class, they can read it again after the “AI Teacher”. Then they will learn how to pronounce the new words in a standard way. In addition, ‘AI Teacher’ may conduct evaluation and give scores in real time, thus easily differentiate non-standard Mandarin pronunciation. Last year, when we recruited tutors for each village and each child in the county, we used ‘AI Teacher’ to test the candidates’ Mandarin proficiency. As soon as the candidates finished reading, their scores would automatically come out.”

2. Experience from the “AI Teacher” programme

(1) Demand-based integration and innovation through AI technologies

Based on the local needs, the system includes a Yi-Mandarin bilingual learning module covering the age range from preschool through kindergarten to primary school children, and deeply integrates AI technologies such as voice recognition and voice evaluation, thus being able to perform intelligent evaluation and correction of children’s pronunciation in real time, and also enabling learning of Pinyin, vocabulary, grammar, etc.

(2) Deeply localized learning content of the system

The programme team, together with the local education bureau and language commission, combed through the commonly used local vocabulary, including appellations, animals, plants, food, Yi costumes, polite language, etc., and invited the local teachers in Zhaojue County to draw related pictures and record Yi-Han bilingual audio. Finally, the commonly used vocabulary was displayed in the form of “picture+Yi-

Han bilingual pronunciation", which was concise, easy to understand, and intriguing. Such kind of localized content is easier to accept for teachers and students.

(3) The programme is aimed at meeting students' needs and supporting the professional development of teachers

During the implementation process, the programme was aimed at meeting students' learning needs while supporting teachers' professional development. The AI system was designed to support students' personalized learning and teachers' big-class teaching. In addition, it also supports training and long-term support for the teachers, so as to enhance their language teaching knowledge and capability.

(4) Cross-platform, cross-device, and low-cost popularization solution

During the implementation of the programme, the particular local conditions were taken into account. A low-cost solution with low requirements for digital devices and network connection was adopted to popularize the system. The system was developed to be functional in a cross-platform and cross-device manner. Coming in PC, iOS and Android versions, the system is easy to popularize and reproduce, has low hardware requirements, and is easy to operate. To learn with the system, the user only needs a computer and a sound system, even in cases without the guidance of a teacher. Besides, as the system can be used off-line, it does not require sophisticated hardware or network support.

(5) Protection of students' privacy

As for the students' voice data involved in the programme, the programme team communicated thoroughly with their guardians and schools before collection, explained the information to be collected and its scope of use, and took measures to ensure safe use of the data.

IV. Main Experience from the “AI Teacher” Programme

1. Main experience from the programme

At the development stage of the programme, the courses were designed from a top-down perspective, and national textbooks were adopted in the design of courses for grades 1-6. During the implementation of the programme, its direction was adjusted in a timely manner. For example, the following suggestion from the officials of the local education authorities was taken, “Many children at kindergarten didn’t learn Mandarin, and would encounter learning barriers during the compulsory education stage due to the lack of Mandarin proficiency. Therefore, bilingual learning tools suitable for kindergarten children need to be developed.” It has proved that such bottom-up suggestions were very meaningful for the smooth progress of the programme. During the implementation of the programme, we also noticed that the children at kindergartens benefited substantially from the programme. They not only learned Mandarin very well, but also achieved good proficiency in their native language.

In addition, in the R&D process of the programme, we communicated with the local government, education authorities and school teachers in a timely manner, listened to their opinions, and considered the daily life experience of local children. Besides, the selected vocabulary was also based on their daily life, all the illustrations were drawn by local teachers, and the pictures were also taken from common scenes in the local life. All these timely adjustments to the strategy have greatly enhanced the relevance of the programme and facilitated its localization.

2. Sustainability of the programme

During the implementation of this programme, TAL provided a seed fund of RMB 2 million, and the local government provided corresponding poverty alleviation fund to ensure the financial sustainability of the programme.

(1) With the advancement of educational informatization in China, the impoverished areas will see further improvements in the infrastructure and hardware conditions and

enhancements in the information processing and storage capabilities required by new technologies.

(2) TAL has maintained regular communication with the Government of Liangshan Yi Autonomous Prefecture and will update the teaching content in a sustainable manner.

(3) The sustainable development of the programme is ensured through continuously supporting teachers in developing their professional competence and increasing their language proficiency and teaching capacity.

(4) The continuous development of native language materials will lead to continuous expansion in the content of the programme. At present, the programme has covered preschool basic Mandarin learning materials and the Chinese language learning content for grades 1 to 6 of primary school. In the future, learning resources and materials will be expanded from time to time on the basis of the current vocabulary for preschool Mandarin learning.

V. Relevance of the Programme

During the implementation of the programme, attention was be paid to the iteration and relevance of technologies. For example, the long-text recognition performance was improved and the adaptability to different scenarios was enhanced. The programme developers said that they had encountered the long-text recognition problem (continuous text with more than 100 characters) during the development process, and by optimizing their own algorithms, they increased the accuracy of long text recognition from 60% to 92%. At the beginning, the length of recording was limited to 90 seconds, which was a challenge for children unfamiliar with language expression. After the algorithm was optimized, now there is no limit on the length of voice recording.

In terms of carrying forward the ethnic culture, considerations were given to the inheritance and protection of the ethnic culture in the system design. The system was designed not only to teach children Mandarin, but also to enable them to develop a deeper understanding and master their own native language, thereby carrying forward

their language and culture. For example, lots of everyday objects of the Yi nationality are displayed on the system.

Besides, during the development process of the programme, teachers and students participated in the development of language materials, turning from passive information consumers into active participants. Their participation made the programme closely adapted to the local conditions and the learning habits of the local children. For example, the selected vocabulary is closely matched with the local children's experience, instead of pushing foreign experience directly to the local children and teachers. This is not only a merit of the programme, but also an aspect that requires continuous attention in the future.

In this programme, local residents participated in the content production, thus permanently preserving the local spoken and written language as well as cultural elements. To date, there are more than 6,000 languages in the world, more than 40% of which have been designated as "endangered" languages by UNESCO. This programme has provided a model for the protection of endangered indigenous languages through innovative technological means.

VI. Conclusions

It is actually an innovation in teaching and learning based on information technology such as AI technology. As a result, it protected the ethnic culture, prepared the ethnic children for bilingual learning, and greatly promoted educational equality.

The evaluation conclusions mainly include the following points:

1. Innovation in education mode: reducing the repetitive burden on teachers

"AI Teacher" has directly changed the role of teachers. The advent of AI teacher has greatly reduced the repetitive work of teachers and played an assistant role in teaching. Instead of replacing teachers, AI is to reduce their burden. The programme has provided schools and kindergartens in impoverished areas with high-quality and

easily accessible educational resources and services needed for Mandarin teaching, introduced innovative language teaching and learning methods, and effectively solved the local shortage of competent bilingual teachers.

2. Innovation in learning methods: making personalized exercises available to students

Big-class teaching and personalized learning have only solved a single problem in local education. After the “AI Teacher” system was introduced, timely evaluation, feedback and personalized interaction became possible, thereby creating a mode of common language teaching for the native language speakers. Apart from big-class teaching, teachers and students can use AI technology to obtain targeted evaluation in the class, and carry out personalized learning at home. The “AI Teacher” system can carry out real-time evaluation of the students’ follow-up reading, and continuously improve the learning effect through the cycle of practice - evaluation - improvement - re-evaluation.

3. Innovation in learning materials: sourced from local life

The learning materials used in the programme, which were produced jointly by teachers, students and other local groups, are closely related to the local conditions and customs, thereby achieving an alignment between the native language and Mandarin. More than 95% of the teachers believe that the illustrated teaching materials provided by “AI Teacher” have greatly improved the creativity of their daily Mandarin teaching. Besides, they believe that the teaching materials in the system have improved students’ comprehension ability in their Mandarin learning process.

Although the programme was originally designed from a “top-down” perspective, it was constantly adapted to the local needs during the R&D and implementation process. In the survey, the programme execution personnel emphasized that the programme was aimed at promoting educational equity. It can be said that this goal has been achieved to some extent by the “AI Teacher”. On the one hand, it has addressed the issue of bilingual learning for the local children; on the other hand, the system, which was developed based on a low-cost IT platform, has indeed made high-

quality resources accessible to more children in ethnic minority areas. Looking back at the previous informatized education products, we can see that localization is a very important aspect. Therefore, this evaluation report is also intended to call on the programme side to consider the realistic problems to be addressed in the future product R&D and implementation process, so as to ensure that the voices of various parties can be heard and their visions be achieved.

Part 3 Analysis and Suggestions

In this part, we will further analyze the “AI Teacher” programme and put forward framework suggestions on how to promote the application of informatized education products for children in resource-poor areas in light of TAL’s development plan for this programme.

On the basis of evaluation, we make the following framework suggestions for the development of an informatized education product that promotes educational equality and improves educational quality.

1. A mechanism should be established to ensure the engagement of teachers and students.

It should be noted that innovation must stimulate the teachers and students to participate, and a certain mechanism should be established to ensure that the participation of local teachers and students is taken as the basic strategy of the programme, and that the voices of children, teachers and other relevant interest groups are heard. Only such education products can meet their real needs. In the process of programme development and implementation, a certain mechanism should be established to ensure that teachers and students participate in the development of language materials. In the future, during the continuous iterative updating of the system, it should be ensured that teachers and students participate in the process, which may promote the localization of the programme.

2. Continuous support should be given to teachers.

The opinions of front-line teachers are very important to the application of informatized education products. To gain the support of front-line teachers, such informatized education products must be products that can solve educational problems and help teachers or students improve their teaching and learning efficiency

and quality, rather than products that add burden to them.

3. Attention should be paid to the changes of mindset of relevant stakeholders during the popularization of innovations.

During the popularization of innovations, there must be various problems, one of which would be the outdated mindset of relevant stakeholders that stops them from accepting innovative concepts. In this case, the promoter of innovations needs to ensure the innovative concept is accepted first before the innovations are accepted. For example, although some innovations may bring greater benefits to users, they also have some disadvantages, and the users or relevant stakeholders may refuse to use them because of the disadvantages. For example, as for this education product, parents and schools are worried that the use of cell phones and tablets may affect students' eyesight, and the schools have also taken certain measures to address the parents' concern, thus facilitating their acceptance of the innovations.

4. Attention should be paid to ethical issues in innovation.

Innovation also involves some ethical issues. For example, disputes would arise from the use of some new technologies in educational informatization. The *Draft Ethics Guidelines for Trustworthy AI* issued by the EU holds that Trustworthy AI has two components: (1) it should respect fundamental rights, applicable regulation and core principles and values, ensuring an "ethical purpose" and (2) it should be technically robust and reliable since, even with good intentions, a lack of technological mastery can cause unintentional harm." During the implementation of the programme, attention should be paid to data security and related issues.

5. The systematic design of the programme should be strengthened.

Before the implementation of the programme, it was only a language learning

tool developed according to the national teaching materials, and its overall teaching design and planning were still not sufficient. During the progress of the programme, the systematic design of the programme should be strengthened. Especially, in response to the national strategy of promoting “bilingual” education in ethnic minority areas, more systematic explorations should be carried out from the perspective of education and the protection of ethnic cultures.

Part IV Closing Remark

The importance of bilingual education at Yi schools in Liangshan is undeniable. For decades, bilingual education at schools in the Yi region has been an enormous experimental programme of bilingual education for human beings, and undeniable achievements have been made. This has not only embodied the ethnic language education policy of the Chinese government, but also provided useful references for the governments of multi-ethnic countries in the world in language education for ethnic minorities and immigrants. However, as Professor Lin Yaohua pointed out, to overcome the adverse factors for bilingual education in the Yi community in Liangshan, it is also necessary to formulate feasible plans that are adapted to the development strategy of the Yi community in the new era. These feasible plans should have realistic short-term and long-term development goals and should be operable.[10] In the new era, emerging technologies such as AI have become new tools for targeted poverty alleviation. Targeted poverty alleviation through education is not only necessary for educational development, but also is an important approach to preventing the intergenerational transmission of poverty and achieving social equity.

In the process of bilingual education, language learning courses should be regarded as a tool for cultural learning, rather than a channel through which the language knowledge is infused. Only when language learning is integrated with the local culture and the students are guided by their teachers to perceive the world through their ethnic culture, can it be possible for them to learn Mandarin and the Chinese culture while inheriting their ethnic language and culture and bring the Yi culture out of Liangshan.[11]

In fact, in the context of poverty alleviation by the Chinese government, poverty alleviation through education is an approach that is worth exploring. The practices of using technologies to enhance educational equity and quality have, to a certain extent,

[10]Lin Yaohua. (2001). Liangshan Yi Families: Cultural Changes and Bilingual Education. *Chinese Minorities* (12), 62-63.

[11]Chai Yuan. (2018). Current Situation and Challenges of Yi-Chinese Bilingual Education in Liangshan Prefecture - From the Perspective of Policy Evolution and Implementation. *Ethnic Education of China*, 231 (10), 46-49.

promoted local social and economic development. This programme represents an innovative practice of using AI to solve the challenges faced by resource-poor areas in achieving SDG 4 objectives, and has provided useful references and experience for the practices of other countries in relevant fields. (End)