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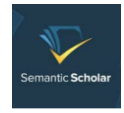


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TABLE OF CONTENTS

SIEF, Vol. 12, No. 2, August 2022

COMMENTARY

The Role of Educational Technology in the Development of Basic Education for Ethnic Minorities

Longjun Zhou

Jiangsu Second Normal University, Nanjing 211200, Jiangsu, China

"Technology will never replace great teachers, but in the hands of great teachers, it's transformational."

–George Couros

As a result of the influence of history, traditions and geographical environments, considerable disparities in economy, culture, and education exist between ethnic minorities and majority nationalities in many countries. To them, how to bridge the gaps between ethnic groups remains a severe challenge. Major nation-states in the world such as Britain, Australia, India, and Russia, have emphasized the importance of equalizing education for all nationalities through legislation. Basic laws and regulations have been promulgated to ensure cultural diversity, secure enrollment opportunities of ethnic minorities, and integrate minority education into the modernized mainstream education (Gu et al., 2015).

Like many other countries, China is also facing issues of uneven educational development, the most pronounced of which is the huge gap in educational levels between its developed eastern regions and western minority areas. Over 40 western ethnic minorities reside in 82 autonomous counties, 27 autonomous prefectures, and 5 autonomous regions, which take up 86.4% area of western China (Wang, 2002). In some western areas that have poor natural conditions, inconvenient transportation and backward communication, primary and secondary schools are struggling with outdated educational fa-

cilities and shortages of high-quality educational resources, which lead to the low enrollment rate of minority children, inadequate supply of qualified teaching staff, and an incomplete basic education system.

To address the disadvantaged circumstances of basic education in western minority communities, Chinese government have implemented a series of targeted measures such as the "poverty alleviation through education", "educational volunteers", and "educational support" projects, to name a few. These projects have played certain roles in improving minority education but cannot eradicate the deep-rooted defects and problems in education in the impoverished western regions. The growth of government investment in ethnic minority education cannot keep pace with the increasing demands for educational funds year by year. As a consequence, many western minority schools failed to meet the nation's standards of school facilities and educational quality (Zeng & Shi, 2010). In addition, the government lacks scientific evaluation and effective supervision over the operation of schools entitled to preferential policies, resulting in low output of investment and waste of resources.

Fortunately, the "Internet Plus" initiative provides new opportunities for transforming ethnic minority education. Inspired by the initiative, governments and educational authorities at all levels have started to change their educational concepts and prioritize the funding for IT infrastructure and facilities to utilize fifth-generation telecommunication technology, artificial intelligence, big data, and other information technologies to promote high-quality development of minority education. Most ethnic minorities inhabit grassland, desert, and high-altitude areas; geographical constraints impeded their communication with the outside world as well as the development of their education. Nonetheless, internet technologies and network connection can provide communication channels to link minority teachers and students to any places in the world so that they have the access to cutting-edge knowledge and technology as their peers in developed regions despite their relatively isolated habitations. With the help of information technology, primary and secondary schools in those economically underdeveloped areas where physical libraries have not been established can now create their digital libraries and share top-notch resources across regions and schools, allowing students anytime, anywhere access to knowledge database and autonomous planning of learning according to individual conditions. The advent of educational technology also introduced new ideas of teaching and learning methods to minority communities. Educators recognize the limitations of the traditional teacher-centered model and have begun to diversify their instructional approaches; students become more pro-active in study in the digital learning environment which makes them aware of the disadvantages of rote learning and allows them sufficient, useful information to construct their personalized knowledge system (Ma et al., 2020).

In recent years, the Ethnic Education Development Center of China's Ministry of Education has been promoting digital education for ethnic minorities by pushing for the integration of information technology into traditional

instruction and the construction of internet-enabled high-efficiency classroom teaching. The Center places premiums on the building of the Nation's Public Educational Resource Platform. Relying on the innovative mechanism consisting of "governments' support policies, enterprises' investment and construction projects, and schools' procurement of service", it has built a big data-based platform featured by stable connectivity, high safety and reliability, low operating costs, and most importantly, useful information, which gives full play to the functions of information science and technology in collecting, storing, and processing high-quality educational resources. At the same time, educational authorities at county and district levels have increased the investment in schools' educational technology facilities, offering full coverage of network, upgrading the terminal equipment of all primary and secondary schools, and popularizing the application of digital learning space. As a result, the basic construction of smart campuses in ethnic minority regions has been achieved. In addition, the Ethnic Education Development Center has been implementing the "Internet Plus" strategy in teacher professional development by offering minority teachers training to enhance their digital literacy as well as ability to apply educational technology in teaching and imposing big data-based intervention on teaching methods, processes, and evaluation. The deepened integration of educational technology into teachers' instruction and research as well as students' learning is initiating a "classroom revolution" in minority primary and secondary schools. It not only helps improve teachers' professionalism, but also extend students' learning beyond textbooks and personalize their study in accordance with their aptitudes and interest (Jiang, Wu, & Yuan, 2014).

In this issue, *Improving Minority Education in China in the "Internet Plus" Era: A Case Study of Southwest Guizhou Autonomous* Prefecture examined the possibility of utilizing digital education to address the shortages of high-quality educational resources in remote, underdeveloped ethnic minority regions (Huang, 2022). *Digital Teaching Research Based on the Intelligent Research and Training Platform: Citing the Practice of the Chinese Teaching and Research Group of Senior Secondary School Affiliated to Xingyi Normal University for Minorities as a Case Study* elaborated on minority school teachers' practice of leveraging the nation's Intelligent Research and Training Platform to improve teaching processes and enhance instruction quality (Gong, 2022). It is hoped that they can spark more research on digital education for ethnic minorities to provide deeper insights into the practice of educational technology-powered teaching and research and to advance basic education for ethnic minorities.

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Correspondence to:
Longjun Zhou, PhD
Jiangsu Second Normal University
Nanjing 211200, Jiangsu
China
E-mail: 294437034@qq.com

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ORIGINAL ARTICLE

The Effect of a Project on Teachers' Self-Efficacy Beliefs in Organizing Trips to Out-of-School Environments

Canan La ̧n-Şimşek, Aysun Öztuna-Kaplan

Education Faculty, Sakarya University, Sakarya 54050, Turkey

***Abstract**: The aim of this study is to determine the effect of a project on teachers' self-efficacy beliefs about organizing trips to out-of-school environments. The present study is a simultaneous mixed pattern research using quantitative and qualitative data. Twenty-four science teachers participated in the study. The effect of training and applications was also evaluated in terms of gender and seniority. Data were collected through Self-Efficacy Belief Scale for Organizing Educational Trips to Out-of-school Environment and open-ended question forms. While there was no difference in self-efficacy beliefs between male and female teachers at the beginning of the project, there was a difference in favor of females at the end of the project. Also, while there was a difference in favor of senior teachers at the beginning of the project, this difference disappeared at the end of the project. As can be seen in the present study, practical activities related to out-of-school learning are very important and such training should be delivered to both in pre-service and in-service teachers.*

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***Keywords**: Field Trips, Out-of-School Learning, Science Center, Science Teacher, Teachers' Self-Efficacy Beliefs*

About authors: *Aysun Öztuna-Kaplan, Education Faculty, Sakarya University, Sakarya 54050, Turkey. E-mail: aoztuna@sakarya.edu.tr. ORCID: https://orcid.org/0000-0001-8133-312X*

Correspondence to: *Canan La ̧in-Şimşek, Education Faculty, Sakarya University, Sakarya 54050, Turkey. E-mail: csimsek@sakarya.edu.tr. ORCID: https://orcid.org/0000-0001-9050-1842*

Ethics: *This research is the product of a project. The project was reviewed and approved by a board before it was accepted. Announcements have been made for the approved project. In the application form, it is stated that data will be collected for a research in the project, the data will be used in scientific publications and photographic and video recordings will be taken. The participants were selected from among the volunteers who accepted these conditions.*

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Conflict of Interests*: None*

Introduction

OUT-OF-SCHOOL learning environments are informal environments, such as museums, zoos, botanical gardens, aquariums, and science centers. Planning the field trips to these environments by associating them with the lessons and providing the teaching of the subjects through these environments is defined as out-of-school learning.

It has been argued for many years that school trips should be associated with school lessons (Falk & Dierking, 1997) but field trips to out-of-school environments require a lot of preparation. These preparations can be grouped under three main headings: official procedures, organization of the trip and instructional preparations (Baker, 2002; Behrendt & Franklin, 2014; DeWitt & Osborne, 2007; Jarvis & Pell, 2005; La çin Şimşek, 2020; Rix & McSorley, 1999). Official procedures include the permits that must be obtained from the institutions and parents related to the trip. These operations must be carried out in accordance with the procedures. In addition, each student's parents must be informed about the trip and their approval for the participation of the student must be obtained (Saul, 1993). The preparations that need to be made in many matters such as choosing the travel location, arranging transportation, providing food during the trip, making accommodation arrangements if the trip takes longer than a day, making reservations, arranging the duration and date of the trip are part of the organization.

In addition to all these, teachers are asked to plan a field trip in a way that links the environment they are going to visit with the lessons. Field trips are trips associated with course subjects. It will be the educational preparations that make out-of-school learning a learning activity. Therefore, teachers are expected to associate the course subjects with the environment visited. For the trips to be efficient, many preparations should be made before, during and after the trip (Coll & Coll, 2018; Laçin Şimşek, 2019, 2020). Before the trip, it is necessary to explain the purpose of the trip to the students, to inform the students about the destination, to prepare the worksheets that are going to be used during the trip and the evaluation tools that are going to be used after the trip. During the trip, teachers should guide students' discoveries and observations, ask questions to make them think, and continue the trip in a way that is relevant to the subject of the lesson, as well as maintain discipline and control the children. After the trip, evaluation forms can be applied to understand whether the expected learning outcomes have been achieved by students. However, in many studies, it is seen that only official procedures and trip planning are emphasized, and any or very little educational activities are done (Tal & Morag, 2009).

All these preparations must be carried out by teachers. All of these create a serious burden on teachers (Griffin, 2004). Researches show that the preparations that need to be done cause teachers to abstain from organizing trips (Rebar & Enochs, 2010; Scribner-MacLean & Kennedy, 2007; Şentürk, 2015). Teachers' concerns about keeping students under control during the trip, bringing them back safely and completing the trip without any problems are frequently expressed. In addition, it is frequently stated that they do not know how to turn these trips into a learning opportunity, and the methods and techniques that can be used (Griffin & Symington, 1997; Tal & Morag, 2009). These types of anxieties are also directly related to experience. It is usual for a teacher who is organizing a trip for the first time to have much more concerns. As the experience of organizing trips increases, the problems of teachers will decrease relatively, and they will feel more competent.

Competence is having the necessary knowledge, skills, and equipment in a subject. For a job to be done well, the necessary competencies must also be well. Personal perceptions and beliefs about being able to do a job are self-efficacy. The judgment about the capacity of individuals to organize the necessary activities and perform them to exhibit a performance (Bandura, 1986) is formed by the individual himself. While competence is having a skill or knowledge, self-efficacy is a person's perception and belief in this. Self-efficacy belief is an important factor for an individual to cope with different situations and achieve a certain activity (Senemoğlu, 2013). It can be said that the higher the self-efficacy beliefs, the higher the self-confidence and motivation of the person to accomplish that job. One's interpretation of one's own performance creates a sense of self-efficacy (Dinther et al., 2011).

It is also possible to define self-efficacy as the self-confidence that an individual needs in performing a certain task that requires effort and persistence. No matter how much potential and advantage an individual has, if s/he does not feel competent in a certain subject, s/he may have difficulty in starting and continuing an action (Erol & Avcı-Temizer, 2016). At this point, it is necessary for teachers to have good self-efficacy beliefs about organizing trips to out-of-school environments that require a lot of preparation and practice. Teachers who are anxious about these trips, those who hesitate and think they are incompetent about organizing and arranging the necessary activities, will abstain from organizing these field trips.

In studies conducted with teachers on organizing field trips to out-of-school learning environments, it was found that teachers felt incompetent about organizing, controlling, and associating the trips with lessons (Griffin & Symington, 1997; Yurdakal ve Karadaş, 2021; Kisiel, 2003; Orion, 1993; Rickinson et al., 2004; Storksdieck, 2001; Tal & Morag, 2009; Tuckey, 1992; Uludağ, 2021). In many studies, teachers, and researchers (DeWitt & Osborne, 2007; Tal, 2004) have stated that they need in-service training in order to develop their knowledge and competencies in these subjects. It has been stated that studies conducted to increase knowledge about out-of-school learning have achieved positive results on these issues. In the study conducted by Bozdoğan (2012), after the theoretical information about the out-of-school environments was given to the pre-service teachers, they were taken to six different environments and the applications were made and then the participants' opinions were asked. At the end of the study, it was found that pre-service teachers felt more competent about organizing trips. Anderson, Lawson, and Mayer-Smith (2006) found the positive effects of field trips in their studies with pre-service teachers. Positive results were also obtained in Moseley, Reinke, and Bookout's (2002) studies on the pre-service teachers' self-efficacy regarding field trips. In the study conducted by Tal and Morag (2009), it was stated that pre-service and in-service teachers had low self-confidence at the beginning but positive developments were observed during field trips with learning experiences. It is seen that the studies in the literature mostly focus on pre-service teachers. It is stated that there is limited literature on preparing teachers for field trips (Tal & Morag, 2009), there are criticisms about how the activities to be done in these environments should be, what can be done for educational purposes before, during and after the trip (Carrier, 2009; Chin, 2004; Morentin & Guisasola, 2015).

When the studies on what needs to be done for out-of-school learning are examined, it is seen that they mostly focus on procedural preparations and little mention of educational goals and preparations. For example, in the study conducted by Tal, Bamberger, and Morag (2005), with 30 teachers in four natural history museums in Israel, they found out that only one-third of these teachers provided specific purposes for

conducting the museum visit, explaining how the visit was connected to the school curriculum. Most of the teachers gave general answers about the purpose of the visit, while in many cases teachers stated that others had planned the visit and they were unaware of the purpose. However, it is the educational activities that will make out-of-school learning a learning activity. A critical need for teachers in this context is to acquire new understandings and skills in using blended learning environment for out-of-school visits to support teaching in the light of a student-centered approach (Coll & Coll, 2018). At this point, teachers should focus on what should be done educationally during visits for out-of-school learning, and these should be included more in in-service and pre-service trainings.

In the present study, teachers were trained on organizing trips to out-of-school environments. They participated actively during the trainings, prepared, implemented, and evaluated the activities themselves. In the studies conducted, it is seen that most of the time, teachers are taken to out-of-school areas and carrying out activities is the basis. In the present study, teachers took an active role in all activities (observation forms, worksheets, educational game et.) prepared. It was aimed to determine the effect of this process on teachers' self-efficacy beliefs about trips and whether it made a difference in terms of gender and seniority (professional experience). Bandura (1997) stated that experience is very important in self-efficacy beliefs. Therefore, it was necessary to make a comparison in terms of seniority. In addition, there are many situations that need attention (such as arranging the tools, disciplining, controlling the children etc.) during a trip (Dillon, et al., 2006). Such requirements may reveal gender differences in self-efficacy beliefs. For this reason, it was felt the need to make an evaluation according to the gender variable.

Purpose of the Research

This research was carried out to determine the effects of the activities carried out in the project on teachers' self-efficacy beliefs in organizing out-of-school environments. For this, answers to the following questions were sought:

Sub-Problems

1. What is the effect of the studies conducted in the project on teachers' self-efficacy beliefs about organizing trips to out-of-school environments?
2. Does the effect of the studies conducted in the project on teachers' self-efficacy beliefs vary by gender?
3. Does the effect of the studies conducted in the project on teachers' self-efficacy beliefs vary according to seniority?

Method

Research Model

In the present study, both quantitative and qualitative research techniques were used together to determine teachers' self-efficacy beliefs. In the study, which was planned as a concurrent/parallel mixed design, it was aimed to elaborate and support the findings

Table 1. Demographic Characteristics of the Study Group.

Study Group	Variable	N
Gender	Female	15
	Male	9
Seniority	1-5 years	6
	6-10 years	13
	11 years and above	5
Age	21-25	1
	26-30	10
	31-35	11
	36-40	2

obtained with more than one data source. Thus, by using qualitative and quantitative methods together, it was ensured that the weaknesses of one method were complemented with the strengths of the other. This pattern contributes to the comparison and interpretation of qualitative and quantitative data, and to strengthen the validity reliability (Creswell & Plano Clark, 2011).

Study Group

The study group of the present research consists of 24 science teachers. The participants were selected from among 360 teachers who applied for the project announcement. The demographic characteristics of the participants are presented in **Table 1**.

Studies Carried Out within the Scope of the Project

The training of the project in this research lasted for 1 week. The following trainings were provided given step by step during the project.

1. First of all, it was explained what is out of school learning. It was especially emphasized that for a school trip to be an out-of-school learning visit, there should be educational activities associated with the lessons. During these trainings, information about what learning is in out-of-school environments, how qualified field trips should be, how these trips can be associated with lessons, and what to do before, during and after the trip was provided.
2. The preparations that needed to be made for the out-of-school learning visit and what to do during and after the trip were explained.
3. Observation forms and worksheets (these are defined as teaching materials) that can be used during the visits are explained and examples were presented. Accordingly, it was stated that the teaching materials that are going to be used in the out-of-school learning environment should enable students to make observations, interact with exhibitions, use the concepts they know, and make new discoveries.
4. Educational games are explained and the features of educational games that can be used in out-of-school learning environments were presented.

5. Examples of observation forms, worksheets and educational games prepared for different out-of-school learning environments were examined by the participating teachers.
6. Afterwards, science centers, one of the out-of-school learning environments that science teachers can benefit the most from, were introduced to the teachers and the science center where the project was carried out was visited.
7. During this visit, teachers were asked to take notes for the teaching materials they would prepare.
8. Since the project took place at the science center, this place was used as an out-of-school learning environment. The teachers were provided with the necessary information regarding for all out-of-school learning environments. However, studies have been carried out on the science centers to improve the skills of preparing teaching materials. The important thing here is that the teaching materials that are going to be used during the visit include questions that guide students to make observations, enable them to explore and think, and help them relate to the course topics. It is important for teachers to develop their knowledge and skills related to this.
9. The teachers prepared teaching materials for 3 days using the exhibits in the science center. For this, they worked in groups of 4 people. During this process, the project experts guided the groups.
10. After 3 days, the teachers gave the teaching materials they had prepared to the other groups for review. Each group tried and examined the materials prepared by the other groups in the science center and gave feedback and evaluations.
11. After the groups presented their feedback, each group reviewed and arranged the teaching materials they had prepared.

Data Collection Tools

In the study, quantitative and qualitative data collection tools were used together. As a quantitative data collection tool, the Self-Efficacy Belief Scale for Organizing Educational Trips to Out-of-school Environment, and as a qualitative data collection tool, open-ended question forms were used.

Self-Efficacy Belief Scale for Organizing Educational Trips to Out-of-School Environments

The scale consists of 30 items developed by Bozdoğan (2016). The scale includes items aimed at revealing self-efficacy beliefs in organizing educational trips to out-of-school environments. The Cronbach Alpha reliability coefficient was 0.93. In the present study, the relevant scale was applied twice as pre-test at the beginning of the project and post-test at the end of the project. The scale is a 5-point Likert type scale. It is scored as I totally agree (5), to I do not agree at all (1). The scale includes 17 positive and 13 negative items. The scores of the negative items were reversed. The Cronbach Alpha reliability coefficient value of the scale in this study was found to be 0.885. Some of the items on the scale are as follows:

1. I find it difficult to guide students at the trip destination.
3. I can enable students to gain practical skills by playing an active role during the field trip.

18. I am confident in guiding students with various questions and enabling them to access information during the field of trip.

Open-Ended Question Form

In the research, two separate forms consisting of open-ended questions were used before and after the project. Forms were filled in individually. In the open-ended question form used in the pre-application, the participants were asked about their ability to organize trips, if they felt competent to organize trips and about the places where they organized trips.

In the open-ended question form used in the last application, they were asked "how they felt about their competence to organize trips to out-of-school environments" and "the contribution of the studies conducted in the project". In the present study, the data collected through open-ended questions were used to support quantitative findings about gender and seniority.

Data Analysis

SPSS 20 package program was used in the analysis of quantitative data. First, whether the group showed normal distribution was tested. Fisher Skewness Coefficient of the test was found to be 1.36. Since the Fisher Skewness Coefficient takes a value between "-1.96 and 1.96", the data is normally distributed and subjected to parametric tests.

Qualitative data were evaluated with content analysis. The answers to the open-ended questions were first examined and coded separately by the researchers. Subsequently, the researchers determined suitable examples by focusing on the data that would support the quantitative findings in the open-ended question form.

Validity and Reliability Studies

The data were first examined separately by the researchers, detailed notes were taken, categories were created, and then a consensus was reached by discussing them. In revealing the findings, the obtained models and categories were highlighted by making direct quotations from the teachers' expressions. No corrections or changes have been made in the quotations. While presenting the expressions, the names of the participants are kept confidential and the nicknames (F = Female, M = Male, Seniority; 1 or 1-5 year, 2 for 6-10 year, 3 for 11- above) given to them are used.

Findings

The Effect of the Studies Conducted in the Project on Teachers' Self-Efficacy Beliefs

20 of the 24 teachers involved in the project organized a trip to an out-of-school environment at least once, and 4 teachers did not. It has been determined that the teachers who organized trips have visited various museums (history museums, science centers,

Table 2. t Test Results on Self-Efficacy Belief Scores.

	N	Mean	ss	t	Sd	p
Pre-test	24	122.62	12.48238	-5.894	23	0.000
Post-test	24	139.17	9.92873			

Table 3. Independent Groups (Gender) t Test Results Related to Self-Efficacy Belief Pre-Test Scores.

Groups	N	Mean	ss	t	Sd	p
Female	15	122.0667	13.3709	-0,277	22	0,784
Male	9	123.5556	11.5554			

Table 4. Independent Groups (Gender) t Test Results Related to Self-Efficacy Belief Post-Test Scores.

Groups	N	Mean	ss	t	Sd	p
Female	15	142.4000	7.5479	2.231	22	0.036
Male	9	133.7778	11.4649			

aquariums, zoos etc.) and they organized city breaks, nature trips and institutional visits. In order to determine teachers' self-efficacy beliefs in organizing trips, the scale "was applied and it was determined whether any change occurred''. The findings obtained are reflected in **Table 2**.

The teachers got an average score of mean = 122.62 in the pre-application, and an average score of mean = 139.17 in the post application. There is an increase in the scores and this increase is statistically significant ($t_{(23)} = -5.894$, $p < 0.05$). Considering that the highest score that can be obtained is 150, it is seen that the self-efficacy beliefs of the group are also at a high level in the pre-application. It is important that this value increases significantly after the project.

This finding is supported by the findings obtained from the open-ended question form. In the open-ended question form asking about their competencies to organize trips to out-of-school environments, it was observed that at the beginning of the project 13 of the teachers stated that they felt competent in this regard, and 3 teachers felt partially competent. While 6 teachers stated that they felt inapt regarding this issue, 2 teachers who had no experience in organizing trips did not comment on this issue. As can be seen, most of the participants find themselves competent to organize out-of-school trips before the project. At the end of the project, it is supported by both quantitative and qualitative data that teachers' self-confidence in their competencies increased.

In the qualitative data, after the project, the teachers stated that they felt better equipped, more conscious, and willing than before in terms of their belief in organizing educational trips to out-of-school environments. At the end of the project, they stated that they felt more competent and gained experience in planning, they realized how to associate the trip with the lesson and how to designing an activity. Sample expressions that will clarify these situations are given in the section of seniority and gender.

Investigation of the Effects of the Studies Conducted in the Project on Teachers' Self-Efficacy Beliefs by Gender

In the applications carried out before and after the project, it was examined whether the teachers' self-efficacy beliefs in organizing educational trips to out-of-school environments differ according to gender, and the data obtained are presented in **Tables 3** and **4** and supported with qualitative data.

As seen in **Table 3**, the self-efficacy belief pre-test scores do not show a significant difference according to the gender factor [$t_{(22)} = -0.277$, $p > 0.05$]. It is seen that the average scores of the female and male participants are very close to each other.

As seen in **Table 4**, it is found that the mean scores of female participants (mean = 142.4000) are higher than the mean scores of male participants [mean = 133.7778, $p < 0.05$]. It has been determined that there is a significant difference in the post-test scores of female participants for making trips out of school compared to male participants.

Examples of the statements of the female participants regarding their competencies at the end of the project are given below:

> A female teacher 9F1, who had organized a trip before, said, "*I never imagined that I could structure this trip. This situation changed my perspective enormously. I realized that while focusing more on the control of the students during the trips, I could actually control their learning very well*." emphasizing her awareness on this issue.
>
> The teacher 21F2, said, "*If I had planned such a trip before participating in this training, I think it would have been completely superficial... I can't wait to take my students to the science center*" and stated that she has become eager in this regard.
>
> The teacher named 23F3, who had many trip experiences before, said at the end of the project: "*I feel quite competent. I will even convey this information to my fellow teachers, I want them to design a trip like this and learn while observing my students' trip*.".

In the statements of the female participants, it is seen that they feel themselves more competent after taking part in the project. Qualitative findings support the significant increase in favor of female participants in self-efficacy belief posttest scores for out-of-school trips.

Investigation of the Effects of the Studies Conducted in the Project on Teachers' Self-Efficacy Beliefs by Seniority

Table 5. One-Way Variance Analysis (ANOVA) Results of Self-Efficacy Belief Pre-Test Scores According to the Seniority Variable.

Group	N	Mean	ss		KT	Sd	KO	F	p
1-5 yrs	5	115.00	11.96	Inter-Group	1250.292	2	625.146	5.626	0.011
6-10 yrs	13	120.00	6.48	In-Group	2333.333	21	111.111		
≥11 yrs	6	134.67	15.86	Total	3583.625	23			
Total	24	122.62	12.48						

Table 6. Bonferroni Test Results Showing Which Subgroups Differentiate Self-Efficacy Belief Pre-Test Scores According to the Seniority Variable.

		Averages Variation	Standard Error	p
1-5 yrs	6-10 years	-5.00000	5.54700	1,000
	11 years and above	-19.66667*	6.38285	0.017
6-10 yrs	1-5 year	5.00000	5.54700	1.000
	11 years and above	-14.66667*	5.20245	0.031
≥ 11 yrs	1-5 years	19.66667*	6.38285	0.017
	6-10 years and above	14.66667*	5.20245	0.031

Table 7. The Corrected Post-Test Average Scores of Seniority Groups.

Group	N	Mean	Corrected Mean
1-5 yrs	5	144.40	146.61
6-10 yrs	13	136.08	136.84
≥ 11 yrs	6	141.50	138.01

Table 8. ANCOVA Analysis Results of Self-Efficacy Belief Post-Test Corrected Scores.

	KT	Sd	KO	F	p
Pre-Test	196.427	1	196.427	2.211	0.153
Seniority	332.545	2	166.272	1.871	0.180
Error	1777.196	20	88.860		
Total	467084.000	24			

Whether the change in teachers' self-efficacy beliefs differs in terms of seniority has been tested and the findings obtained are presented in tables.

As seen in **Table 5**, the difference between the arithmetic averages of the seniority groups was found to be statistically significant because of the one-way variance analysis (ANOVA) conducted to determine whether the pre-test arithmetic mean of the scale of self-efficacy beliefs showed a significant difference compared to the seniority variable [$F = 5{,}626$; $p < 0.05$]. Thereupon, complementary post-hoc analysis techniques were used to determine which groups caused the significant difference after ANOVA. The hypothesis of whether the variances of group distributions are homogeneous or not was tested with Levene's test and it was determined that the variances were homogeneous (Levene = 1.931; $p = 0.170$). Bonferroni multiple comparison technique made on this was preferred and the analysis results are presented in **Table 6**.

According to the results of the post-hoc test, the average scores of the self-efficacy belief scale of teachers with seniority of 11 years or more were found to be comparable to the results of teachers with seniority of 1-5 years ($p = 0.017$) and teachers with seniority of 6-10 years ($p = 0.031$), in favor of teachers of 11 years or more. As seen in **Table 7**, no statistically significant difference ($p > 0.05$) was found between the average scores of teachers with 1-5 years of seniority and those with 6-10 years of seniority.

Since the pre-test results differed by seniority, the analyses were continued with ANCOVA. Post-test average scores of seniority groups, which were corrected according to their pre-test scores, are given in **Table 7**.

When **Table 7** is examined, according to the corrected posttest scores, the post-test average score of the teachers with 1-5 years of seniority is 144.40, while the corrected average score is 146.61. The final test average score of teachers with 6-10 years of seniority is 136.08, while the corrected average score is 136.84. The post-test average scores of teachers who are 11 years and over were 141.50, while their corrected average score was found 138.01. As can be seen, the final test corrected scores of the groups are different from each other. ANCOVA was applied to test whether this difference was significant or not, and the results obtained are presented in **Table 8**.

In **Table 8**, it was seen that there was no statistically significant difference between the post-test average scores of the teachers, which were corrected according to the pre-test average scores [$F_{(1\text{-}20)} = 1.871$, $p = 0.180$]. In this case, it can be said that the difference between the pre-test score average, which is in favor of teachers with a seniority of 11 years or more, get closed after the application, and the teachers' self-efficacy beliefs with less than 10 years of professional experience have improved thanks to the project.

When the qualitative data were analyzed, it was found that the teachers with 11 years of seniority felt themselves competent at the beginning of the project because they had more experience in the profession than the participants with less seniority. For example, the teacher named 17F3, who has 11-15 years of experience, stated that she organized trips to different places and made plans by "*Organizing trips to the places relevant to the topics and gains we dealt with"* and felt competent in this regard. However, at the end of the project, the same teacher said, *"The detailed trips we made, the worksheets we created, the observation forms, and the exhibitions allowed me to have an idea about how I should use them. I think that thanks to the activities I have done here, I can make not only the trips to the science center, but all the trips I will make, in my field, more productive."* and added *"It has become easier for me to associate any trip I will make with a lesson, a gain. Thanks to this project, I learned what kind of path I should*

follow". Even if the teacher has experience in organizing trips, it is comprehended from her expression that she did not have enough knowledge about how the trips should be structured. Similarly, the teacher named 18M3, who stated that he organized many trips and felt competent, said, *"The meeting held on the first day, about preparing a study [sheet] and observation form, made me realize my shortcomings*," and stated that the project work contributed a lot to his personal and professional development.

While some of the teachers with less seniority stated that their self-efficacy was lacking at the beginning of the project, others stated that they view themselves as competent. For example, 3M2, one of the teachers with a seniority of 6-10 years, stated that he did not feel fully competent, and at the end of the project said, "*I will take students to visit the science center and reinforce the subject and provide easier and fun learning",* stated that he gained self-confidence, felt *"more developed" and added "We learned how to implement planning".* Similarly, 8F2 stated that he had not organized a trip before, and he felt inadequate about it. At the end of the project, *"I had no idea about this. It made me conscious and confident about this*." she said, and "I feel more conscious and qualified about associating." she added.

On the other hand, 19M2 stated that there were too many places in the city where he was located, he organized too many trips and said that he saw himself as competent. However, at the end of the project, he said, "*I realized that we need to improve ourselves a lot and constantly renew and develop ourselves*."

10K1, one of the teachers with 1-5 years of seniority, stated that he is new in the profession and that he has little travel experience; he said "*I think I have a lot to learn about it*." At the end of the project, he said, "*It helped me to learn about the subjects that I found insufficient*" and "*I gained new information on how to associate the science center visits with the lessons and make these visits more meaningful*".

Although she has organized trips to many different places, 16F1 said before the project, "*I don't think I am enough. I couldn't guide the students very well during the trip I organized."* she stated at the end of the project, *"I think I am better at this issue now. The activities and feedbacks made helped a lot*"

As can be seen in the statements of the teachers, it was determined that the teachers, whether they are senior or have less seniority, see themselves much more competent in organizing field trips at the end of the project. It can be said that this difference, which also occurs in quantitative results according to seniority, has been disappeared because of the acquired knowledge and experience.

Discussion

In the present study, in which the effect of the project carried out in the science center on out-of-school learning was investigated, it was observed that the activities carried out during the project had positive effects on teachers' self-efficacy beliefs of organizing trips to out-of-school environments. At the beginning of the project, it was determined that teachers' self-efficacy beliefs were high, and this was supported by qualitative findings. Although self-efficacy beliefs were high even at the beginning of the project, it was observed that the studies carried out during the project further increased the teachers' self-efficacy beliefs at the end of the project. This result can be evaluated as the effect of teachers actively designing activities and making applications.

It is very important for teachers to develop self-efficacy beliefs about being able to organize trips to out-of-school environments, because teachers who do not have confidence in this issue will be reluctant to organize trips. Whereas trips to out-of-

school environments have positive effects on students cognitively, affectively and psychomotorly (Bakioğlu, Karamustafaoğlu, Karamustafaoğlu & Yapıcı, 2018; Bozdoğan and Kavcı, 2016; Bozdoğan & Yalçın 2006; Ertaş, Şen & Parmaksızoğlu, 2011; Jarvis & Pell, 2005; Michie, 1998; Saidi & Sigauke, 2017), and it have been identified in many studies. Therefore, it is important to organize trips associated with the lessons, and teachers have a lot of responsibility at this point (Falk & Dierking, 2000; Hein, 1998; Jarvis and Pell, 2005). At the end of the study, the teachers stated that they were both better equipped and more willing on this subject.

In the comparison of teachers' self-efficacy beliefs based on gender, there was no difference between male and female teachers at the beginning of the study, but at the end of the study, it was observed that the difference developed in favor of female teachers. At this point, it is possible to say that as the knowledge of female teachers about these activities where there is a high burden in terms of responsibilities increased their self-efficacy beliefs also increased. In a study conducted by Bozdoğan (2012) with pre-service teachers, it was found that female participants were more concerned about safety, accidents, and discipline than male teachers.

In the study on seniority, it was found that teachers with more seniority had higher self-efficacy beliefs at the beginning of the project. It is normal that those who have been teaching for many years have more experience due to the possibility that they have organized more trips, and therefore have high self-efficacy beliefs. In the study conducted by Tal (2001), it was found that pre-service teachers and teachers who are new in the profession were more hesitant to organize field trips. Sontay & Karamustafaoğlu (2017) concluded that science teachers' self-efficacy belief scores on organizing trips are affected by professional experience but not by gender. As a result of the project studies, it is seen that this difference has disappeared. Here, too, it is possible to say that to get information about the educational preparations (before, during and after the trip) to organize trips to out-of-school environments, to prepare teaching materials (observation forms, worksheets, and educational games) that can be used in these trips, and to conduct discussions about these forms has an important in the development of these beliefs. Because, in self-efficacy belief, the knowledge and experiences (Aydın, İnnalı, Batar & Çakır, 2013) play an important role, it can be emphasized that it is important for the in-service trainings to be practical.

In the questions asked to the teachers about the impact of the project the teachers stated that they felt much more competent and equipped about how the trips should be organized. They stated that they became aware of the organization of the trip and the preparations that need to be made, and that they learned how the trip could be associated with the lesson. Since the success of the trips is directly related to the preparations made before, during and after the trip (Jarvis & Pell 2005), it is known that teachers' guidance is very important for students (Cox-Peterson & Pfaffinger, 1998). It has been found that teachers' knowledge and awareness on this issue have increased.

It is very important to have experience and knowledge for out-of-school activities. This will give both motivation and encourage the organization of such field trips. In the study, many participants stated expressions according to this finding and explained that their experiences throughout the project increased both their motivation and desire. Lakin's (2006) study also asked pre-service teachers whether they would organize a trip to the river. The pre-service teachers stated that they would not want to travel because of the risks. However, after the field trip to the riverside, it was determined that most of them became enthusiastic about this issue. In the study carried out by Carier (2009), it was stated that pre-service teachers were hesitant at first because they did not

experienced activities carried out in nature before, and they felt more competent in this regard after the activity. As in these studies, it is emphasized in many other studies that applied activities related to field trips to both pre-service and in-service teachers should be done (Cox-Petersen and Pfaffinger 1998; Michie 1998; Olson et al. 2001).

Conclusion and Recommendations

Griffin (1994) states that teacher' perceptions, perspectives, values and motivations are very important factors for the trip they will organize and that these directly affect the quality of the trips they organize. Therefore, it is very important to increase the awareness and knowledge of teachers about their role in field trips, to practice and to gain experience In the present study, not only were the out-of-school learning environments introduced to the teachers, but most importantly, what could be done educationally in these environments was explained and teaching materials were prepared. It is seen that these materials provide teachers with a better understanding of how educational practices should be in out-of-school learning. It has been observed that the studies conducted have created very positive results on teachers. It is thought that especially practical training has a significant contribution to this. In the present study, the things that can be done in out-of-school learning environments were explained giving the example of a science center, and applications were made in the science center. Botanical garden, zoo, aquarium etc. applications can be made in many different environments. In addition, researches can be carried out with students, and students' ideas can be obtained.

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ORIGINAL ARTICLE

Undergraduate German as a Second Foreign Language Learning Experience and Improvement Strategies

Lequn Zhang

Nanjing University Jinling College, Nanjing 210000, Jiangsu, China

***Abstract**: In order to speed up international cooperation and exchange, the government is encouraging higher education institutions to provide more foreign language courses in addition to English in light of China's progress in reform and opening up. This study used interview and questionnaire surveys to analyze the current state of German language education as a second foreign language and student learning involvement in it in China. The goal was to understand students' experiences learning German as a second foreign language. Additionally, suggestions were made to enhance the structure of college German courses for non-German majors.*

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***Correspondence to:** Lequn Zhang, Nanjing University, Jinling College, Nanjing 210000, Jiangsu, China. E-mail: 2391498529@qq.com*

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ONE of the most widely spoken languages in the world, German is most commonly spoken in the European Union. The German language has significantly influenced art, philosophy, and other facets of global culture since the Middle Ages. Because of Germany's dominance in global health and chemistry, learning German has become crucial for academics in these fields. The study of German is becoming more popular among college students nowadays as a result of the rapid expansion of Sino-German commercial and cultural ties; some of them choose to study German alongside English as their primary foreign language (hence referred to as "German as SFL"). China has seen a 33% increase in the number of German language learners between 2015 and 2020, making it one of the nations with the greatest rate of growth in the world (Li & Roelcke, 2019). Little research has looked at how college students learn when studying German as SFL; the majority of studies on German instruction to date have concentrated on the issues with and solutions for its classroom teaching. A crucial determinant of learning quality is the student learning experience. Examining student learning is a crucial step in determining how well the course "German as SFL" is teaching its students. Additionally, two important aspects of students' learning experiences are course perception and learning engagement (Chen & Jia, 2020). Course perception is the degree to which students are satisfied with the course content and the caliber of the instruction; learning engagement is the extent to which students engage in particular practices, such as devoting time and effort to the study of the course (Ma, 2020). The purpose of this study is to investigate how students perceive the course "German as SFL," how engaged they are with it at the moment, and how course perception affects student involvement in learning. Pertinent suggestions are made to enhance the caliber of the curriculum and the learning results of the students.

Literature Review

Students' practical perception of learning processes as well as their behavioral and mental involvement in them are all included in the learning experience (Li, 2001). Students are aware of the course's quality through their learning experience since they are active participants in both in-class and out-of-class learning.

Individuals' direct reactions to a learning setting are their course perceptions (Shi & Yan, 2009). Their view of the learning environment has a significant bearing on their learning strategies and outcomes. In the middle of the 20th century, Ramsden et al. examined student perception of various aspects of a course, such as classroom instruction, classroom tests, and teaching quality, using questionnaires, interviews, and other methods. They concluded that ideal course perception consists of five essential components: effective classroom instruction, clear course objectives, acceptable learning loads, scientific testing methods, and learning autonomy. These are the five criteria specified by Ramsden for the Course Experience Questionnaire.

Alexander W. Astin, a well-known scholar in the field of assessing the quality of undergraduate education in the United States, conceived "learning involvement" as one of his earliest academic concepts. He argued that learning engagement is a significant element influencing student learning outcomes and that student academic achievement is favorably connected with the amount of time and effort invested in meaningful learning activities (Lu & Lyu, 2015). The current study examines learning involvement in three dimensions: behavioral, cognitive, and emotional involvement, in order to obtain more detailed information about student learning experiences in studying German as an SFL and to provide more targeted recommendations for improving course quality.

Research Design

Research Subjects

Students majoring in non-German subjects from colleges and universities in Nanjing, Jiangsu Province, were polled for the current study. A total of 211 questionnaires were returned from an online survey that was conducted. With English majors making up 40.76% of the 211 students, other foreign language majors making up 13.74%, and non-foreign language majors making up 45.50%, all 211 students decided to acquire English as their first foreign language. We further filtered the sample using "learning German as SFL" as a criterion and discovered that 40.76% of the respondents were doing so. In order to conduct this study, 86 valid questionnaires were gathered. We discovered through the earlier literature analysis and student interviews that most higher education institutions offer the course "German as SFL" in the second or third academic year, so we did not focus our questionnaire survey on freshmen and seniors. Sophomores made up 65.4% of the final sample, followed by juniors with 23.22%.

Research Methodology

The two main methodologies used in this study were questionnaires and interview surveys. Interviews were primarily performed for two reasons: to aid in the questionnaire design and to aid in the interpretation and analysis of the statistical results. Three interviewees (01-M, 01-F, and 02-F), who teach German in colleges and universities in Jiangsu Province, participated in extensive online and in-person interviews. 02-F serves as the dean of the German Department at a famous university in Nanjing. 01-M and 01-F are lecturers in the German Departments of their respective schools and have been teaching "German as SFL" for many years. A 31-question questionnaire with both single-answer and multiple-answer questions was developed based on the analysis of the interview's contents and a review of pertinent literature. Data on the implementation of the courses, students' perceptions of the courses (such as the duration of the course, the teaching method, etc.), and student learning involvement (such as the average weekly time input in after-class learning) were gathered in addition to the respondents' personal information (such as gender, grade, school ranking, etc.). The data from the questionnaire survey was then statistically analyzed using SPSS 28.0. The analytical approach chosen to investigate the impact of students' perceptions of "German as SFL" on their learning involvement is multivariable linear regression.

Research Findings

Student Course Perception of "German as SFL"

The learner's personal experience shapes how they perceive the course, which includes a range of genuine, direct, and focused emotions. The "German as SFL" course standards, classroom satisfaction, the complexity of the teaching materials, the alignment of class hours and course content, and more are all covered in the questionnaire (such as duration of the course and weekly class hours). The outcomes of the data analysis are as follows:

In general, student satisfaction with "German as SFL" courses is extremely high. A total of 89.5% of the students surveyed rated the course's classroom instruction as "satisfactory" or "very satisfactory." In the interview with Teacher 01-F, he stated that his "German as SFL" class has been thriving due to high student attendance, active student participation in classroom activities, and outstanding academic environments. His institution has established a Sino-German cultural center that provides an exceptional language environment and high-quality learning tools for both German majors and "German as SFL" students in order to suit their educational demands. The institution provides additional training and tutoring to "German as SFL" students in order to assist them pass the College German Test-4 and -6 (optional for Chinese undergraduates).

The majority of institutions offer "German as SFL," which lasts 150–160 total class hours over one or two years with four–two hours of instruction per week. According to 86% of the students who responded to the survey, this amount of time was "sufficient" or "absolutely adequate" for them to accomplish this course. Learners of "German as SFL" in China utilize the textbook as their primary source of instruction (two volumes in total). While 51.2% of the students believed that before-class preparation and after-class study were necessary for a basic understanding of the topic, 45.4% of the students thought that its content was rather simple. Most schools blended the traditional teacher-centered instructional model with the learning-through-practice approach as their primary teaching strategies for this course. Teacher lectures took up 65.1% of class time; student in-class practice took up 27.9%; group work, presentations by students, and teacher comments took up 5.8%. Teachers' interviews provided additional support for this data analysis finding. Due to the initial phase of learning German's complexity and the course's short class period, instructor 01-M noted that teachers must spend a significant amount of class time imparting knowledge. Both teachers (01-M and 01-F) indicated that the college and its German department, with the help of German majors, would organize pertinent activities like German recitation contests and oral German-based games in order to give "German as SFL" learners more opportunities to practice oral German. Nevertheless, 62.8% of the respondents thought that the manner in which the teaching of content was presented needed to be changed, and 45.4% of them recommended boosting classroom engagement.

Student Learning Involvement in the Course

Before the course, 76.7% of the students had no foundation in German, and 18.6% of them had only a little bit of fragmentary knowledge; during and after the course, 66.8% of them acquired the fundamental rules of reading and writing German as well as a certain level of vocabulary and grammar, and 10.4% claimed that they had mastered almost all the grammar knowledge and acquired a large vocabulary, capable of communicating with native speakers. Furthermore, nearly two-thirds of the students received a

grade of 80% or above on their most recent final test. The aforementioned results demonstrated that these "German as SFL" students were eager to put time and effort into their language studies and had a good attitude toward learning both in and outside of the classroom. This study tried to assess student behavioral, cognitive, and emotional involvement in the course in order to explain student learning involvement in "German as SFL" (Chen et al., 2021).

Behavioral Involvement

A fundamental part of learning participation is behavioral involvement, which is a clear representation of student learning engagement. When filling out this questionnaire, "German as SFL" students' behavioral involvement was evaluated based on how much time they spent studying after class and whether they used online resources to continue their studies. While the remaining students spent 2-3 hours or more doing this, 62.8% of students spent 1-2 hours per week reviewing what they had learned in class and getting ready for the material they would learn the following week. About 83.7% of them stated they would continue learning German using online resources after class, such as watching web videos or online courses to strengthen grammar learning; using learning apps to help them remember words (like German Assistants); participating in social forum discussions about learning strategies for "German as SFL," etc.

Cognitive Involvement

Cognitive involvement describes the efforts made by students to develop learning processes. The students who participated in the survey set several learning objectives for their "German as SFL" course and created matching learning plans. According to the questionnaire results, 78% of the students planned to concentrate on their majors and go on with their German studies in line with the curriculum; the remaining students worked to meet the requirements for German majors and get credentials in German-related fields. Approximately 25.6% of the students have short-term learning objectives (e.g., to obtain qualification certificates via tests), and 22.1% of them are capable of creating comprehensive plans that take into account both their language proficiency and learning objectives. The College German Test-4 requires students to increase their vocabulary to between 2,500 and 3,000 words, which necessitates additional study strategies outside of the course objectives, according to Teacher 01-F, who was also questioned. About 97.7% of those who had set explicit plans could carry them out and adjust them in light of new information.

The students who participated in the poll were also acutely aware of the difficulties they encountered while learning "German as SFL" and actively engaged in looking for answers. For example, 82.6% of them thought German grammar was quite complicated. They would study the teachings after class and prepare for the following lesson to ensure classroom effectiveness as a means of overcoming this challenge, as well as consult the teacher in their free time. In addition, 58.1% of the students felt they had few chances to practice speaking German. As a result, they would search for language friends on social media, watch movies and read books after class to immerse themselves in the language.

Emotional Involvement

The key indicators of student emotional involvement are their favorable attitudes toward learning activities and their motivation to continue their studies in the same field. On the one hand, students are generally satisfied with the "German as SFL" course. Of them, 91.9% responded "Yes" to the question "If given the opportunity to reconsider the choice, would you still pick German as the second foreign language?" despite the difficulty of the language they perceived after beginning the course (such as the time-consuming word memorization caused by complex word formation and part-of-speech division). It was compelling proof of the students' emotional investment in the lesson. However, a minority number of students did become dissatisfied with the course as a result of German's comparatively greater level of difficulty when compared to most other foreign languages. For instance, 7% of students decided not to continue studying German after the course because of the pronunciation issues they encountered, which made the beginning of the course extremely difficult for them.

The Effect of Student Course Perception on Learning Involvement

To examine the impact of course perception on learning involvement, two variables from sub-dimensions of learning involvement were used as dependent variables: student after-class time input in "German as SFL" and higher-order pursuit and extra input in the course, which were the best indicators of student time and energy investment in it.

The Impact of Student Course Perception on their After-class Time Input in "German as SFL"

A multivariable linear regression model was developed in order to investigate the impact of course perception-related variables on student after-class time input in "German as SFL." According to **Table 1**, the independent variables associated with course perception might account for 13.8% of the variation in the amount of after-class time students spent participating in "German as SFL." As a result, there was a favorable overall influence of student course perception on their after-class participation in "German as SFL." Students' impression of the course's weekly class hours in particular had a significant positive impact on how much time they contributed outside of class, demonstrating that after-class time contributions were positively connected with class hours. In other words, students become more invested in the language the longer they study it in class, and as a result, they become more driven to continue learning it outside of class. In contrast, students' perceptions of the textbook's difficulty had a significant negative impact on the amount of German they learned outside of class. This demonstrates that students are less motivated to learn German after class, the harder it is considered to be.

The Effect of Student Course Perception on Higher-order Pursuit and Additional Input in the Course

In order to investigate the effect of student course perception on their higher-order pursuit and additional input in "German as SFL," this study used a multivariable linear regression model. **Table 2** demonstrates that the course perception-related independent variables could account for 10.5% of the variance in student higher-order pursuit and

Table 1. The Effect of Student Course Perception on Their After-class Time Input in "German as SFL".

	Unstandardized Regression Coefficients		Standardized Regression Coefficients		
Independent Variables	**Beta**	**S.E.**	**Beta**	**t**	**p**
Intercept	1.770	0.729		2.428	0.017
Timing of the Course (1st yr=1, 2nd yr=2, 3rd yr=3, ≥ 4th yr=4)	-0.132	0.115	-0.133	-1.143	0.256
Duration of the Course (1 yr=1, 2 yrs=2, ≥ 2 yrs =3)	-0.120	0.096	-0.135	-1.241	0.218
Weekly Class Hours (< 2=1, 2-4=2, > 4=3)	0.297	0.136	0.245	2.185	0.032
Adequacy of the Class Hours (Completely Adequate=1, Adequate=2, Inadequate=3)	0.115	0.144	0.096	0.801	0.425
Difficulty of the Current Textbook (Too Easy=1, Easy=2, Difficult=3, Too Difficult=4)	-0.220	0.121	-0.201	-1.825	0.072
Course Satisfaction (Very Satisfactory=1, Satisfactory=2, Uncertain=3, Unsatisfactory=4)	-0.044	0.117	-0.044	-0.376	0.708
df (Total)	86				
R^2	0.138				
F	2.108				
Durbin-Watson value	1.941				

extra input in "German as SFL," indicating that, generally speaking, student course perception had a positive impact on their higher-order pursuit and extra input in "German as SFL." Additionally, this learning involvement-related dependent variable was most positively impacted by students' perceptions of the timing of the course, suggesting that the earlier students start learning German as a foreign language, the more likely it is that they will set more ambitious and clear goals for it.

Conclusions and Recommendations

In general, students studying German as a second language were relatively pleased with the course, particularly with regard to the teaching materials, textbook selection, and evaluation of their performance. However, they agreed that classroom instruction should be adjusted to be more student-centered. Some students responded to the questionnaire survey that they were dissatisfied with the traditional teacher-centered classroom model and wished that teachers would convey educational content in more effective ways and provide more possibilities for student participation.

The student learning participation in "German as SFL" is, nevertheless, far from satisfactory. Only 37.2% of them, as revealed by the survey findings, were willing to dedicate two hours after school each week to course review and preparation, which is certainly insufficient time for learning a somewhat challenging language. From the

Table 2. The Influence of Student Course Perception on their Higher-order Pursuit and Extra Input in the Course.

	Unstandardized Regression Coefficients		Standardized Regression Coefficients		
Independent Variables	**Beta**	**S.E.**	**Beta**	**t**	**p**
Intercept	1.026	0.683		1.502	0.137
Timing of the Course (1st Year=1, 2nd Year=2, 3rd Year=3, ≥4th Year =4)	0.280	0.108	0.306	2.588	0.011
Duration of the Course (1 yr=1, 2 yrs=2, ≥ 2 Yrs=3)	0.035	0.090	0.043	0.388	0.699
Weekly Class Hours (< 2=1, 2-4=2, > 4=3)	-0.103	0.127	-0.092	-0.808	0.421
Adequacy of the Class Hours (Completely Adequate=1, Adequate=2, Inadequate=3)	-0.054	0.135	-0.049	-0.400	0.690
Difficulty of the Current Textbook (Too Easy=1, Easy=2, Difficult=3, Too Difficult=4)	0.128	0.133	0.127	1.135	0.260
Course Satisfaction (Very Satisfactory=1, Satisfactory=2, Uncertain=3, Unsatisfactory=4)	0.077	0.110	0.085	0.704	0.484
df (Total)	86				
R^2	0.105				
F	1.547				
Durbin-Watson Value	1.763				

viewpoints of students and instructors, we made an effort to pinpoint the causes of this phenomenon based on discussions with three interviewees. First off, the lack of opportunities for language usage, at least in the near term, is the main cause of students' poor engagement in "German as SFL." As stated by Teacher 01-F, most schools offer this course in the second and/or third academic year, when English majors are still unsure of their plans to sit for the postgraduate entrance examination (where a second foreign language qualification is required) and other students have not yet made up their minds about continuing their studies in German-speaking countries after graduation. Second, the development of the course has not received enough attention from the foreign language teaching community because "German as SFL" is not a required course at all universities. This has led to a shortage of German language instructors, outdated teaching materials, and outdated teaching models, among other issues.

The aforementioned issues with "German as SFL" diminished student learning experiences because the caliber of classroom instruction has a direct impact on student learning involvement (Biggs, 2003). The study makes the following suggestions for future enhancements to the course's student learning environment:

Strengthening Team Building of German Language Teachers

First, as staff shortages have led to high workloads for German teachers and subpar teaching outcomes, schools and institutions should hire more German language instructors to bring down the student-teacher ratio. Second, in order to improve teaching quality, schools should develop a system for selecting and keeping skilled German instructors for this course. Instead of learning a second language to pass language proficiency exams, most university students prefer to do so in order to use it as a tool to access professional materials relevant to their majors. This explains why some instructors and learners may not be serious about learning a second foreign language. Skinner's theory of reinforcement can be used to impose positive reinforcers (such as pay raises and promotions) on the conscientious and responsible instructors while imposing negative reinforcers on the less qualified ones to get them to stop acting irresponsibly. Thirdly, schools should offer chances for professional growth to "German as SFL" instructors, such as in-service training, further education, and peer interaction. To satisfy their unique training needs, teachers should be able to choose the training materials and formats on their own. To enhance the teaching quality of "German as SFL," it should be encouraged to conduct teacher education research and exchange ideas internationally.

Increasing Class Hours for the Course and Personalizing Student Learning

The majority of "German as SFL" students begin the course with no prior knowledge of the language. Despite having a significant capacity for language acquisition, individuals may nonetheless face difficulties at first due to interference from English. A challenging language cannot be mastered in one year with only 150 teaching hours. Schools can increase the number of hours spent in class each week while maintaining the course length in order to accommodate the time needed to learn a language. For college students with particular needs, they can either extend the course's duration or extend it to the fourth academic year. In most schools, the second or third academic year is when the course is offered. Students cannot develop language skills sufficient to pass the postgraduate entrance exam or to meet the standard of working language in such a short period of time spent cramming instruction. Instead, this type of instruction can only prepare students for the GER A1 and A2 tests or the College German Test-4.

Optimizing the Course Design and Enriching the Avenues of Learning German as SFL

Since "German as a Second Foreign Language" is an introductory course, the difficulty of the course material should be kept at an acceptable level in order to gradually pique students' interest in the language. The emphasis of instruction should shift from the interpretation of grammar to the comprehensive training of students' listening, speaking, reading, and writing skills. Also, students' knowledge of literature and art should be increased by acquiring a second foreign language.

In addition, colleges and universities can enhance students' understanding of the cultures of German-speaking nations by assisting them in finding language partners, organizing lectures, and sponsoring knowledge competitions after class. Familiarizing students with relevant cultures is favorable to sparking a stronger interest in foreign language acquisition. Additionally, interdisciplinary collaboration can be introduced

into the "German as SFL" curriculum. For instance, German language can be taught in conjunction with important disciplines such as German literature, philosophy, and sociology, as well as English, the sister language of German, to broaden the course's learning material and increase its attractiveness.

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ORIGINAL ARTICLE

The Relationship between Text Formality and Writing Quality: An Evaluation Based on Coh-Metrix

Yaojing Xie

Guangxi University of Foreign Languages, Nanning 530222, Guangxi, China

***Abstract**: This study seeks to investigate the relationship between text formality and writing quality by quantifying text formality in EFL English writing. In order to conduct the research, 548 English argumentation compositions were evaluated in terms of the five Coh-Metrix text formality dimensions: narrativity, syntactic simplicity, word concreteness, referential coherence, and deep cohesion. Based on the study, there is only a weak relationship between text formality and writing quality, and some facets of text formality, such as narrativity, word concreteness, syntactic simplicity, and deep cohesion, have varying degrees of influence on writing quality and, consequently, on English writing scores. As per statistics, narrativity has a detrimental effect on writing quality; word concreteness has a significant positive correlation with writing quality; syntactic simplicity shows a relatively small negative correlation with writing quality; deep cohesion has a modestly negative correlation with writing quality; and referential coherence has no correlation with writing quality. It is intended that the findings of this study will have some bearing on how English argumentative writing is taught and learned.*

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***Keywords** Text Formality, Writing Quality, Coh-Metrix*

Introduction

THE Coh-Metrix, a computational facility that analyzes texts on most of the levels of multilevel theoretical frameworks, was "developed, refined, and tested between 2002 and 2011 at the University of Memphis" (McNamara et al., 2014. P.1) (Graesser et al. 2004). Coh-Metrix, an automated text analysis tool, includes a plethora of indices that can comprehensively examine textual features and is freely available on the website (http://www.cohmetrix.com). Numerous studies have been conducted since the introduction of the Coh-Metrix to validate its use in assessing the features of texts. These studies collectively used Coh-Metrix to differentiate a wide range of texts (Louwerse et al., 2004; Graesser et al., 2007; Crosssley & McNamara, 2011; Graesser et al., 2011). Recently, some Chinese scholars have used Coh-Metrix to conduct in-depth studies on the relationship between textual features and writing quality. For example, see the relationships between lexical proficiency and writing quality (Gui, 2010); the relationship between cohesive devices, lexical and syntactic features, and language proficiency (Wang, 2012); the relationship between readability, lexical frequency, and cohesion with writing quality (Du & Cai, 2013); the relationship between lexical diversity, syntactic complexity, and coherence with writing quality (Li et al., 2014); and the relationship between coherence and writing (Diao, 2019). Some of these studies suggest that textual features such as lexical and syntactic features, coherence, and so on can reflect the quality of English writing. However, Coh-Metrix's analysis of the relationships between text formality and writing quality is still in its infancy. In light of this, the current study uses Coh-Metrix to measure the formality of 548 English argumentative compositions across five dimensions: narrativity, syntactic simplicity, word concreteness, referential coherence, and deep cohesion. The goal is to figure out the relationship between text formality and writing quality.

Text Formality

The Notion of Text Formality

In the 1970s, Labov first asserted that formality is a universal dimension of stylistic variation (Graesser et al., 2014). This was followed by a significant amount of textual

Correspondence to: *Yaojing Xie, Guangxi University of Foreign Languages, A-19 Wuhe Avenue, Nanning 530222, Guangxi, China. E-mail: 416381594@qq.com*

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formality research that concentrated on discourse diagnostics (Chafe, 1982; Biber, 1988; Heylighen & Dewaele, 2002), the classification of texts into formal and informal language or style (Olson, 1977; Richards et al., 1997), and the definition of formality (Atkinson, 1982; Bussmann, 1996; Richards et al., 1997; Andren et al., 2010; Heylighen & Dewaele, 2002). In this study, the Coh-Metrix measurements are used to examine text formality. To make sure everyone understands, it is important to define important terms used in the article.

- Narrativity

A narrative text is one that tells a story using well-known characters, plot points, settings, and objects. Daily, oral conversation is intimately related to narrative. This element is closely related to vocabulary, general knowledge, and oral language. On the other end of the spectrum are works that don't tell a story and focus on less well-known topics (McNamara et al., 2014).

- Syntactic Simplicity

This element measures how many words are used in each sentence and how many simple, well-known syntactic structures are used in each sentence, both of which make reading the text easier. Texts with longer sentences and more complicated, foreign syntactic patterns fall on the other end of the spectrum (McNamara et al., 2014).

- Word Concreteness

Content words are concrete and meaningful, and they have the ability to evoke mental images. Texts with more content words are easier to understand and process. Abstract words are used to express ideas that are difficult to visualize. Texts that contain more abstract words are more difficult to understand (McNamara et al., 2014).

- Referential Coherence

Words and ideas that overlap across sentences and the entire text form explicit threads that connect the text to the reader in texts with high referential cohesion. Texts with low cohesion are typically more difficult to process because there are fewer connections that connect ideas for readers (McNamara et al., 2014).

- Deep Cohesion

When there are causal and logical relationships within the text, this component reflects the degree to which the text contains causal and intentional connectives. These connectives assist the reader in developing a deeper and more coherent understanding of the text's causal events, processes, and actions. When there are many relationships in a text but no connectives, the reader must infer the relationships between the ideas in the text. (McNamara et al., 2014) say that a text's relationships and global cohesion are made clear if it has a high level of deep cohesion.

The Measurement of Text Formality

The formality score (F-score), the adjective density formality score (ADF-score), and the composite formality score (CF-score) are three regularly used computer metrics of text formality. A formality indicator called the F-score was developed by Heylighen and Dewaele in 2002. It rises when pronouns, adverbs, verbs, and interjections are used less frequently than nouns, adjectives, articles, and prepositions. According to Fang and Cao

(2009), an adjective density formality score may accurately predict how formal a text will be when it is read by humans who are classifying it. Li et al. (2014) investigated what characteristics predict formality as people understand the concept, and the findings supported the idea that formality, a significant aspect of stylistic diversity, is related to linguistic qualities spanning multiple levels of discourse. According to Graesser et al. (2014), there is a composite formality score that incorporates the five main Coh-Metrix dimensions. The PCNARz (z-score of Text Easability PC Narativity), the PCSYNz (z-score of Text Easability PC Syntactic Simplicity), the PCCNCz (z-score of Text Easability PC Word Concreteness), the PCREFz (z-score of Text Easability PC Referential Cohesion), and the PCDCz (z-score of Text Easability PC Deep Cohesion). According to this definition, a z-score is "a standard score that reflects how many standard deviations an observation or data point is above or below the mean, where the mean is fixed at 0." (McNamara et al., 2014, p84). The formula for calculating a text's formality score, according to Graesser et al. (2014), is formality = [referential coherence + deep cohesion-narrativity-syntactic simplicity-word concreteness]/5. So, it's clear that the composite measure of formality is more than just adding up the values of the five dimensions.

Methodology

Research Questions

The following questions will be addressed by this study:
(1) What is the relationship between text formality and writing quality?
(2) How and to what extent does text formality affect writing scores?

Research Subjects

The selection of reasonable and representative research materials is important in order to provide scientifically sound answers to the research questions. A total of 548 argumentative compositions, each with roughly 300 words, were chosen from the Written English Corpus of Chinese Learners (WECCL 2.0) in order to ensure the validity of the data gathered (Wen et al., 2009). More than 20 Chinese institutions are the sources for the compositions in WECCL 2.0, which are of various types and academic levels and were written by English and non-English majors.

Research Instruments

Two corpus-based technologies, Coh-Mix 3.0 and Juku Correcting Network, are used in this study to make sure that the results are pretty accurate.

Coh-Merix 3.0, a free online automated computational evaluation tool, is used to extract a large set of data from large text corpora reflecting linguistic features. In this study, Coh-Metrix is used to calculate the values of the five critical indices of text formality: PCNARz, PCSYNz, PCCNCz, PCREFz, and PCDCz (McNamara et al., 2014).

Juku Correcting Network (Juku) is a large-scale corpus of native English speakers that is used as a benchmark or reference to evaluate the disparity between Chinese students' essays and texts in the established corpus. It could provide comprehensive, analytic scores on a 100-point scale, as well as diagnostic feedback. This online

service software allows users to revise their essays multiple times based on analytic and diagnostic comments and suggestions for improvement. In this study, Juku was used to rate all of the compositions that were chosen.

Research Procedure

First, Juku and two college writing instructors graded a total of 548 argumentative essays. The graders individually assessed the pieces using a holistic, analytical scoring rubric in accordance with the grading profile developed by Jacobs et al. (1981). The marks for human rating were determined by averaging the two graders' evaluations of each essay. Then, the final score was made by taking the average of the scores given by Juku and human graders to show how well the argumentative essay was written.

Then, based on the final average score from Juku and human assessors, all of the argumentative writing samples were split into three categories (the full mark is 100). The compositions in the high-score group ($x \geq 81.5$) had scores that were in the top 25%. The low-score group ($x \leq 77$) consisted of the bottom 25% of performers. And the remainder of them comprised the middle-score group (x = score, $77 < x < 81.5$). As a consequence, there are 141 compositions with a low score, 259 compositions with a middle score, and 148 compositions with a high score.

The textual features of these argumentative essays were then analyzed using Coh-Metrix in three groups. They were put into Coh-Metrix 3.0, and the results were saved as an Excel spreadsheet so they could be used later.

Finally, after obtaining the data for the variables of text formality for all of the argumentative essays, SPSS 19.0 was used to conduct the statistical analysis. To be more specific, one-way ANOVA was used to determine whether or not there were any discernible differences in writing scores between the three groups. Then, Pearson Correlation Analysis was used to figure out how the five text formality indices and writing quality were related to each other.

Results and Discussions

Differences in the Indices of Text Formality among the Three Groups

One-way ANOVA was used to look at these five text formality indices and see how the three groups were different. The results are shown in **Table 1**.

According to the test of homogeneity of variances of the six text formality variables, all of the significance values are greater than 0.05 ($p = 0.370$, $p = 0.234$, $p = 0.090$, $p = 0.869$, $p = 0.214$, and $p = 0.110$, respectively), indicating that each index in the three groups has the same variance. As a result, the data from the One-way ANOVA analysis shown below are correct. According to the One-way ANOVA analysis results, there are significant differences in four text formality indices (PCNARz, PCSYNz, PCCNCz, PCDCz) and text formality itself (with $p = 0.000$, $p = 0.001$, $p = 0.000$, $p = 0.026$, and $p = 0.000$, respectively). Also, PCREFz doesn't show any big differences between the three groups, which means that this text formality index can't tell the difference between good and bad writing.

Post-hoc tests were used to determine which two groups had statistically significant differences in the four indices. **Table 1** summarizes the findings.

Table 1. Comparisons of the Five Indices of Text Formality of the Three Groups.

	Group1 (n=148)		Group2 (n=259)		Group3 (n=141)		F (2, 545)	Post Hoc
	M	SD	M	SD	M	SD		
PCNARz	0.20638	0.433663	0.37897	0.489220	0.56334	0.491860	20.341*	Group1<Group2 Group1<Group3 Group2<Group3
PCSYNz	-0.06414	0.644012	0.15278	0.647669	0.20489	0.772123	6.718*	Group1<Group2 Group1<Group3
PCCNCz	0.14779	0.890424	-0.15834	1.024769	-0.71691	0.961938	29.419*	Group1>Group2 Group1>Group3 Group2>Group3
PCREFz	-0.12415	0.752105	-0.07679	0.772617	0.00009	0.844723	0.920	
PCDCz	1.05170	1.003139	0.95704	1.018328	1.25408	1.135157	3.689*	Group2<Group3
Text Formality	0.14575	0.334636	0.10137	0.306195	0.24057	0.346718	8.398*	Group1<Group3 Group2<Group3

** The mean difference is significant at the 0.05 level.*
Group1=the High-Score Group; Group2=the Middle-Score Group; Group3=the Low-Score Group

First, in terms of PCNARz, there are distinct differences between three groups [$F(2,545) = 20.341$, $p < 0.05$]. This demonstrates that PCNARz can distinguish between writing quality. It is possible to conclude that narrativity has a significant influence on the quality of argumentative writing. Furthermore, as shown in **Table 1**, the mean value of PCNARz in the high-score group ($M = 0.20638$) is lower than in the middle- and low-score groups ($M = 0.37897$, $M = 0.56334$). As a result, the higher the PCNARz value, the lower the writing score, as reported by Graesser et al. (2011).

Regarding PCSYNz, there is a major difference between Group 1 and Group 2 and Group 1 and Group 3 [$F(2,545) = 6.718$, $p < 0.05$], indicating that PCSYNz differs significantly between the high- and middle-score groups as well as the high- and low-score groups. However, there is no distinction between Group 2 and Group 3 in PCSYNz. Thus, it is evident that syntactic simplicity can discriminate between groups with high and low scores but cannot distinguish between groups with moderate and low scores. In addition, the mean value of PCSYNz in the group with the highest scores ($M = -0.06414$) is 0.26903 lower than that of the group with the lowest scores ($M = 0.20489$). This shows that the writing score will decrease as PCSYNz increases. Texts with longer sentences and unusual, complicated grammatical structures are likely to receive better marks. This conclusion fits with what Graesser et al. (2011) found, which is that texts with lower scores tend to have syntax that is easier to understand.

There are statistically significant variations between the three groups in terms of PCCNCz [$F(2,545) = 29.419$, $p < 0.05$] It indicates that there are significant variations in this index not only between groups with high and low scores or high and middle scores, but also between groups with middle and low scores. This shows that PCCNCz can differentiate writing quality and can serve as a predictor of writing scores. In addition, according to **Table 1**, the mean value of PCCNCz in the high-score group ($M = 0.14779$) is 0.8647 greater than that in the low-score group ($M = -0.71691$), indicating

Table 2. Correlation between the Indices of Text Formality and Writing Scores.

		PCNARz	PCSYNz	PCCNCz	PCREFz	PCDCz	Text Formality
Writing Score	Pearson Correlation	-0.267**	-0.189**	0.332**	-0.045	-0.128**	-0.131**
	Sig. (2-tailed)	0.000	0.000	0.000	0.292	0.003	0.002
	N	548	548	548	548	548	548

** The correlation is significant at the 0.05 level.*
*** The correlation is significant at the 0.01 level.*

that the writing scores will be higher as PCCNCz increases. This also suggests that texts with more concrete and meaningful content words are thought to be of higher quality.

For PCREFz, there is no statistically significant difference between the three groups [$F(2,545) = 0.920$, $p > 0.05$]. And only between Groups 2 and 3 is there a significant difference in PCDCz [$F(2,545) = 3.689$, $p < 0.05$]. These results indicate that PCREFz and PCDCz cannot be utilized to distinguish between groups with high and low scores. This conclusion seems to be in line with earlier findings that "referential coherence and deep cohesion did not differ systematically or significantly across grade levels" (McNamara et al., 2014, p.86).

Lastly, when it comes to the overall formality of text, there is a significant difference between Group 1 and Group 3 [$F(2,545) = 8.398$, $p < 0.05$], but there is no difference between Group 1 and Group 2. The results indicate that text formality differs significantly between groups with high and low scores, as well as between groups with intermediate and low scores. However, there is no difference in text formality between high-and middle-scoring groups.

Text Formality and Writing Quality have a Relationship

Table 2 shows a weak negative correlation between text formality and writing scores ($r = -0.131^{**}$, $p < 0.01$). Also, among the five text formality indices, PCNARz, PCSYNz, PCCNCz, and PCDCz have statistically significant relationships with writing quality.

First, it is discovered that there is a negative correlation between PCNARz and writing quality ($r = -0.267^{**}$, $p < 0.01$). The evidence suggests that narrative may have a detrimental effect on writing quality and that the amount of narrative in an argumentative essay will determine its writing score. This is probably because the corpora put more weight on argumentative essays, which put argument over story.

Looking at PCCNCz, a more significant positive correlation between word concreteness and writing scores is found ($r = 0.332^{**}$, $p < 0.01$), indicating that texts with more concrete and meaningful words may receive higher scores than those with more abstract words. The findings are consistent with previous research (Graesser et al., 2011).

In terms of PCSYNz, there is a weak negative correlation between syntactic simplicity and writing quality ($r = -0.189^{**}$, $p < 0.01$). Even though this result is slightly different from the finding that "syntactic simplicity was the dimension most highly correlated with grade level" (McNamara et al., 2014, p.87), both agree that syntactic simplicity is related to writing quality.

Table 3. Results of Unitary Regression Analysis on the Five Predictive Variables and Writing Quality.

Predictive Variables	R	R^2	Adjusted R^2	F	Unstandardized Coefficients	Standardized Coefficients	*t*
PCNARz	0.267	0.071	0.070	41.904***	80.009 -1.812	-0.267	459.991*** -6.473***
PCSYNz	0.189	0.036	0.034	20.135***	79.420 -0.916	-0.189	559.372*** -4.487***
PCCNCz	0.332	0.110	0.108	67.515***	79.559 1.083	0.332	577.294*** 8.217***
PCDCz	0.128	0.016	0.015	9.125**	79.753 -0.408	-0.128	396.358*** -3.021**
Text Formality	0.131	0.017	0.015	9.523***	79.519 -1.329	-0.131	511.396*** -3.086**

***p*< 0.01, ****p*< 0.001

For PCDCz, its correlation coefficient (r =-0.128**, p < 0.01) is so low (r < 0.20) that it is plausible to assume that there is a weak correlation between deep cohesion and writing quality.

Regarding PCREFz, there is clearly no correlation between referential coherence and writing scores (r = 0.045, p > 0.05). This is consistent with prior studies demonstrating that cohesion does not explain writing quality. Instead, McNamara et al. (2014) found a link between good writing and measures of text difficulty and use of advanced language.

Linear Regression of Relationships between Text Formality and Writing Scores

A linear regression analysis to explain the linear relationships between text formality and writing quality was conducted in order to answer the research question "How and to what extent does text formality affect writing scores?"

The PCNARz, PCSYNz, PCCNCz, PCDCz, and text formality are the five factors that were found to be correlated with writing quality in the latter phase of the study (the five independent variables). Unitary linear regression analysis is used in the current study to determine the degree to which each independent variable impacts writing scores. The dependent variable in this study is writing score.

The total impact of text formality on writing quality is negligible, as seen in **Table 3**, as it can only accurately predict 1.5% (Adjusted R^2 = 0.015) of the variance in writing scores. PCNARz, PCSYNz, PCCNCz, and PCDCz may explain 7% (Adjusted R^2 = 0.070), 3.4% (Adjusted R^2 = 0.034), 10.8% (Adjusted R^2 = 0.108), and 1.5% (Adjusted R^2 = 0.015) differences in writing scores, respectively. In other words, writing scores are influenced to varying degrees by narrativity, grammatical simplicity, deep cohesion, and word concreteness. Thus, it may be argued that narrativity, grammatical simplicity, deep cohesion, and word concreteness may all have weak but potential predictive effects on writing quality. This result does not quite agree with Wang's (2012)

claim that there are no indications of syntactic complexity that have demonstrated their capacity to predict the caliber of writing. Furthermore, according to Du and Cai (2013), cohesiveness is strongly connected with writing scores, with their Coh-Metrix indices accounting for 17% of the variance in writing scores. However, this investigation was unable to find any such proof.

Summary

Based on the findings of this study, the formality of the text has little bearing on the caliber of the writing. We can suppose that text formality has a relatively minor detrimental effect on writing scores because it can only predict 1.5% of the variance of writing scores. With the exception of PCREFz, the specific indices of text formality PCNARz, PCSYNz, PCCNCz, and PCDCz have demonstrated statistically significant correlation with writing scores, which can be used as writing score indicators. In particular, PCCNCz has a comparatively substantial positive impact on writing scores, while PCNARz, PCSYNz, and PCDCz exhibit obvious negative relationships with writing scores. This implies that the argumentative essays with better scores may have lower PCNARz, PCSYNz, and PCDCz values but higher PCCNCz values. It is therefore reasonable to draw the conclusion that word concreteness and writing quality are positively correlated, but narrativity, grammatical simplicity, and deep cohesion are negatively correlated. In conclusion, there is a little inverse relationship between text formality and writing caliber. Additionally, among the five textual characteristics, narrativity and word concreteness, which can explain 7% and 10.8% of the differences in writing scores, respectively, are confirmed to be able to differentiate between writing quality in different score groups. Writing quality is slightly impacted negatively by syntactic simplicity and deep cohesion, which predict 3.4% and 1.5% of writing score variations, respectively. However, this study did not find a relationship between referential coherence and writing quality.

Limitations

Although the findings may be useful for future research, the following limitations should be acknowledged:

First, this study has focused on only one textual feature, text formality, which the author believes has the greatest pedagogical value. However, writing is a complex process that includes other factors (such as grammatical and semantic features) that influence writing quality. These aspects were not addressed in this study.

Further, human grading involves many subjective factors that influence the assessment of writing quality. Even though the samples were scored by two professional evaluators with a lot of experience, a larger group of evaluators may improve the reliability and validity of the research findings.

Third, because this study only includes argumentative essays written by a specific group of Chinese EFL learners, the findings cannot be generalized to other discourse genres (e.g., narrative, expository, or descriptive) or other types of learners (e.g., native English learners). Without a doubt, it will be helpful to look at more genres or study more people with different levels of proficiency to learn more about how formality of text affects the quality of writing.

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ORIGINAL ARTICLE

Digital Teaching Research Based on the Intelligent Research and Training Platform: Citing the Practice of the Chinese Teaching and Research Group of Senior Secondary School Affiliated to Xingyi Normal University for Minorities as a Case Study

Jie Gong

Senior High School Affiliated to Xingyi Normal University for Minorities, Xingyi, 562400, Guizhou, China

***Abstract**: The Intelligent Research and Training Platform (IRTP) of the National Center for Educational Technology (NECT) is an application designed to integrate AI technology and teacher education in response to the "Artificial Intelligence + Teacher Education" strategy, in order to provide teacher professional development and power the advancement of basic education. In this study, a school teaching and research team conducted instructional research on the seventh-grade Chinese lesson Wisteria, utilizing analytical reports of classroom observation, teaching behavior, and teacher ability matrix generated by the Intelligent Research and Training Platform's big data-based evaluation of classroom teaching for this lesson. Using data analytics and scale grading, this kind of practice helps teachers get better at doing research in their own fields.*

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***Keywords**: The Intelligent Research and Training Platform, Artificial Intelligence, Digital Teaching Research, Learning Analytics*

***Correspondence to:** Jie Gong, Senior Secondary School Affiliated to Xingyi Normal University forMinorities, Xingyi 562400, Guizhou, China. E-mail: 565926620@qq.com*

***Conflict of Interests**: None*

THE Intelligent Research and Training Platform of the National Center for Educational Technology (NCET) is a precision teaching research platform that supports regional and school-online or online-offline blended teaching research. It makes digital teaching research viable and fruitful by combining AI technology with teacher training in an efficient manner. When scale-based analysis and AI learning analytics are used, teaching research methods, teacher professional development, and monitoring of teaching quality all get a lot better.

The "Four-order Strategy" for digital teaching research, developed by NCET, includes the following applications: fundamental teaching research; large-scale online teaching research; intelligent precision teaching research; and blended collaborative teaching research. In order to demonstrate how to use the applications provided by the Intelligent Research and Training Platform to modify the teaching process and improve instruction, this study uses the teaching research on the Chinese lesson Wisteria in the seventh grade conducted by the Chinese language teaching and research group of Senior Secondary School Affiliated to Xingyi Normal University for Minorities (Xingyi is the capital city of Southwest Guizhou Autonomous Prefecture). In addition to improving the results of teaching studies, this kind of digital teaching research can help teachers improve their research skills, information literacy, and management skills.

Utilizing the Basic Teaching Research Application to Improve Classroom Instruction

Powered by developing technologies such as AI, big data, cloud computing, and the 5th generation of communication technology, the Intelligent Research and Training Platform is able to record in-depth information regarding classroom interactions. Through recorded and stored data of instructional activities, teachers can assess the teaching process from a variety of perspectives, find the gaps between their instructions and the requirements, and get more opportunities for in-depth investigations. The Platform's basic teaching research application can be used to plan lessons and study them in order to create a pattern of teaching research that is based on data rather than on experience (Dai et al., 2022).

This application was used by the teaching and research team to evaluate the effectiveness of the Wisteria lesson's instruction. According to the Platform's AI learning analytics, the teacher lectured for 87.13% of the class period, and the first activity took place in the classroom for 15 minutes before the pupils' performance decreased to 20% after 28 minutes (**Figure 1**). The class was categorized as being dominated by the teacher. Given this, we asked, "What kind of instructional activity design can get students more interested in learning and improve their language skills?"

In an effort to identify answers to the issues, the teaching and research group then researched pertinent literature and looked into connected elements. The "A Strategy to Enhance Student Chinese Language Competence" fishbone diagram was created in the end (**Figure 2**). It has four parts: (i) teaching strategies, objectives, and tasks; (ii) instructional materials, such as learning scenarios, formative evaluation, and rewritten learning objectives; (iii) classroom culture, which emphasizes a learning environment and encourages student inquiry; and (iv) student learning, which includes attentive listening, group work, and independent study.

Initiating Large-Scale Online Teaching Research

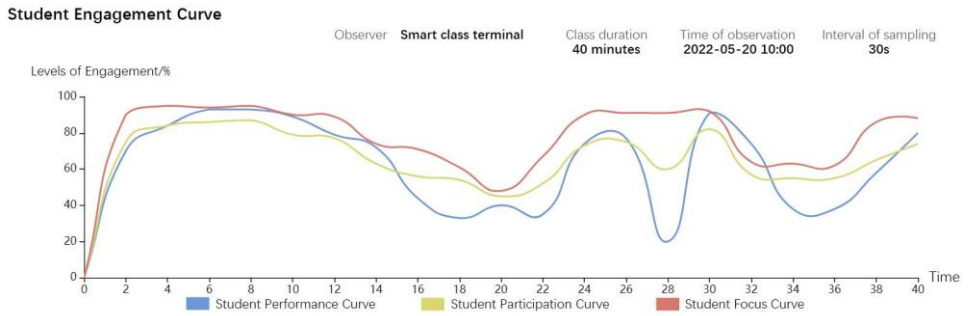

Figure 1. Student Engagement Curve.

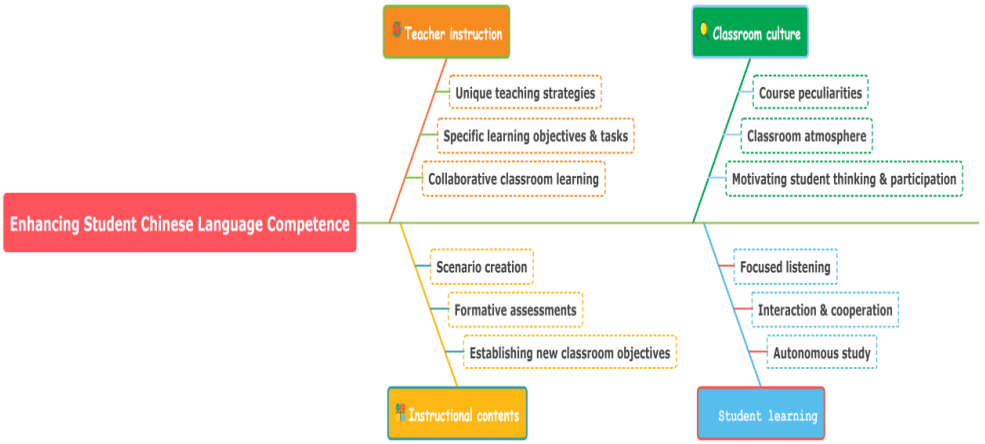

Figure 2. A Strategy to Enhance Student Chinese Language Competence.

The Platform's extensive online teaching research application enables each individual instructor to post standardized digital learning resources online so they can be effortlessly transported across geographies and organizations reliant on the openness of the internet. This free-flowing pattern of communication has also given rise to a new kind of connection among educators that satisfies their demands for deep contact and knowledge sharing. In this social network, educators can freely express their thoughts and find inspiration for fresh ideas. A teacher can access lessons shared online by their peers and find solutions to their own issues after registering on the Intelligent Research and Training Platform. A simple digital terminal and an internet connection are all that are needed for this learning procedure. Teachers can also create or join groups on the site by using real-time videos, trust values, and personal information identification. Teachers from various schools and areas come up with the research themes for their group and use theme-based group discussions and brainstorming to identify solutions to

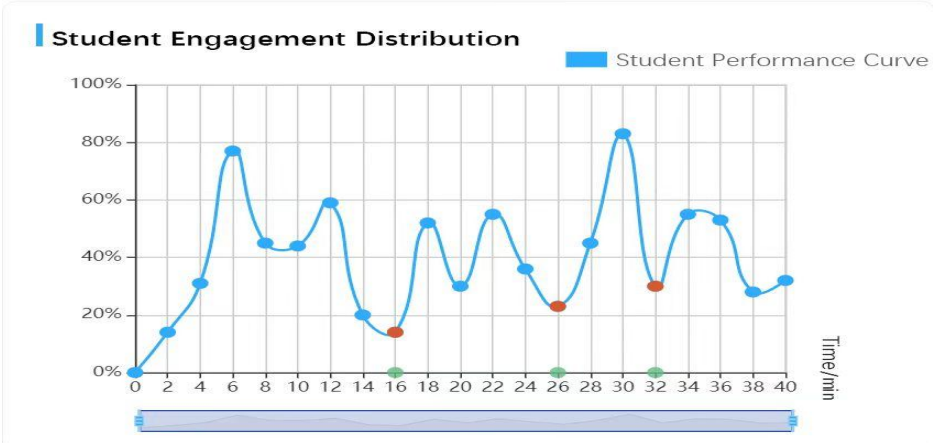

Figure 3. Student Engagement Distribution in the Demonstration Lesson of *Tough Journey*.

Nos.	Observation dimensions	Behaviors	*Wisteria* (%)	*Wisteria* (%)
1	Student Behaviors	Reading & writing	26.43	40.25
2		Raising questions	0.72	0.61
3		Focused listening	62.13	40.53
4		Inter-student interaction	1.43	11.29
5		Answering questions	9.29	7.32
6	Teacher Behaviors	Blackboard presentation	0.00	0.31
7		Classroom lecturing	87.13	60.78
8		Teacher-student interaction	7.15	25.23
9		Classroom inspection	5.72	13.68

Figure 4. A Comparison of Student and Teacher Behaviors in the Two Trials of the Lesson *Wisteria*.

their teaching challenges. During this process, everyone in the group shares what they know, which leads to new experiences (Ai, 2020).

For instance, data analytics findings show that a demonstration lesson for A Tough Journey is a paradigmatic situation that many junior secondary Chinese teachers can use as a model. Members of our teaching and research group were urged to use the platform's extensive online teaching and research application to analyze this lesson in-

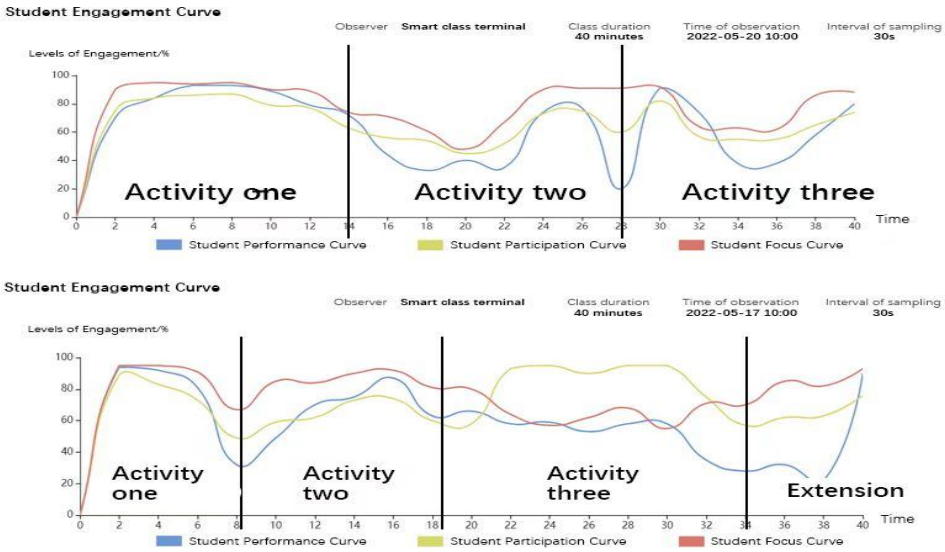

Figure 5. A Comparison of Student Engagement Curves for the Two Trials of the lesson *Wisteria*.

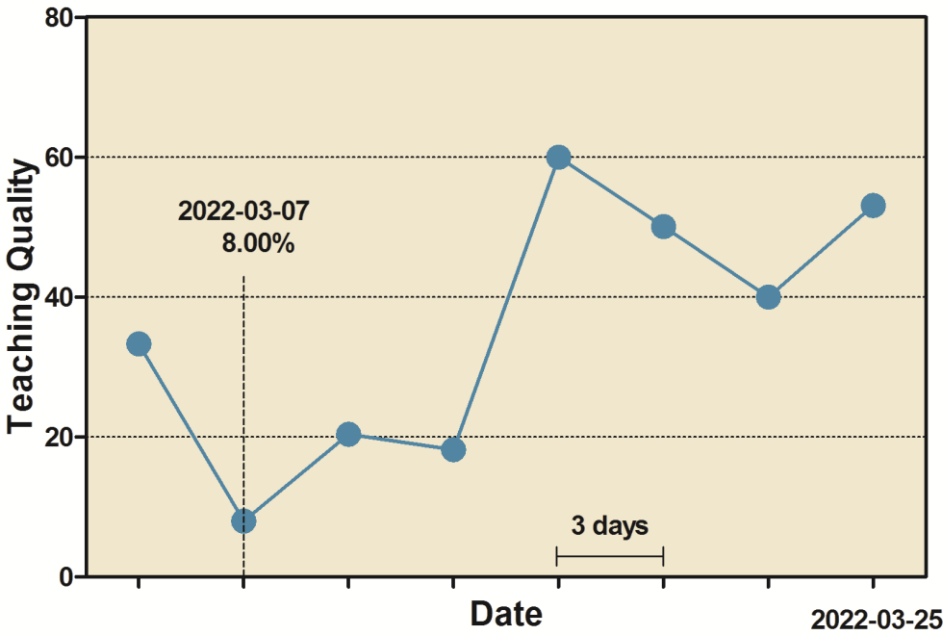

Figure 6. A Personal Periodic Portrait – Teaching Quality.

depth. According to the analytical report of the demonstration lesson of A Tough Journey created by the intelligent research and training platform, the student performance curve in the three intervals between the sixteenth, twenty-sixth, and thirty-second minutes is fluctuating on the student engagement distribution diagram (**Figure 3**), indicating a lack of consistency in the students' behaviors. Nevertheless, an examination of the lesson's video revealed that the students' erratic actions were compatible with the lesson's structure because, at the time, they were doing group inquiry assignments as instructed by the teacher. The emphasis of the lesson's lesson plan is on this assignment. The outcomes of the data analytics also indicated that the teacher had good control over the development of the class. Teachers who were watching this lesson online gave comments at significant moments and wrote suggestions in the note sections.

Classroom culture, specific learning objectives, and task division were discovered to have significant positive effects on the teaching outcomes of the demonstration lesson A Tough Journey by the teaching and research group. Informed by this discovery, we modified the Wisteria lesson plan using the standard fish bone diagram. **Figure 4** depicts the findings of data analytics for the two trials of this lesson in terms of classroom behavior. Interactions between students and between students and teachers were much better in the second trial. The amount of lecturing and classroom inspection was adjusted to a reasonable level, and a blended teaching model was used instead of the teacher-centered model used in the first trial.

The mean value of the student engagement curve grew from approximately 80% in the first trial to approximately 87% in the second trial, as depicted in **Figure 5**. The increase from 78 to 90 points on the scale indicates an improvement in all dimensions. Examining relevant data showed that the new teaching plan has helped students learn Chinese better.

Employing the Intelligent Precision Teaching Research Application to Promote Teacher Professional Development

Learning analytics is an emerging field of study that uses data on students' learning behaviors, artificial intelligence, and analytic models to evaluate academic progress, forecast future performance, and identify potential problems. Cai & Li (2021) argues that visual output and displays of data analysis outcomes are fundamental to learning analytics. Learning data visualization helps measure and effectively illustrates the teaching process and its outcomes. Consequently, learning analytics can also be used to improve the quality of instruction. Similarly, NECT's Intelligent Research and Training Platform can generate real-time and dynamic records of the training process of in-service teachers in order to create portraits of their teaching motivation, ability, and preferred teaching style, so as to better assist training participants in understanding their own teaching outcomes and provide targeted improvement plans. School teaching and research organizations can also use the teaching data of trainees obtained by the platform to diagnose classroom instruction by analyzing specific situations to address prevalent issues (Huang & Ruan, 2022).

For example, the Personal Periodic Portrait of Teaching Quality created by the Platform for the author for the previous semester (**Figure 6**) shows that in a class on February 28th, teacher lecturing accounted for 98.62% of the total teaching behavior, while teacher-student interaction took up only 1.38%; a class on March 7th scored only

8% in terms of teaching quality. The other two members of the teaching and research group received scores of 17.2% and 13.7% for their two classes on March 8th, respectively, according to their individual periodic portraits. As a result, the data diagnosis revealed that the quality of classroom instruction at the start of the semester was subpar. After introducing the Intelligent Research and Training Platform, the teaching and research group implemented a number of online theme-based teaching research activities to assist teachers in creating better teaching strategies. These strategies were later used in classroom instruction and significantly increased the quality of the teachers' instruction. The author's Personal Periodic Portrait revealed that the second half of the semester's average instruction quality scored 77.5%. The teacher-centered teaching approach has given way to blended and practice-based classroom approaches. The teaching skills of the other people in the group also got a lot better, and one of them got an 82.2% score.

Conclusion

The Intelligent Research and Training Platform of NCET incorporate teacher research and training into educators' everyday teaching practice. Visualization of learning data on the platform facilitates a move from an experience-based to an "experience + data-based" education research pattern. IT-enabled teaching research maximizes the utilization of high-quality educational resources, hence enhancing the professionalism and quality of instruction of instructors.

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ORIGINAL ARTICLE

Improving Minority Education in China in the "Internet Plus" Era: A Case Study of Southwest Guizhou Autonomous Prefecture

Jiliang Huang

Educational Technology Center, Southwest Guizhou Autonomous Prefecture 562400, Guizhou, China

***Abstract**: Southwest Guizhou Autonomous Prefecture has been at the forefront of developing digital education for China's ethnic minorities. The prefecture uses the Jinzhou Educational Cloud Platform, which is based on improved digital infrastructure, to improve teachers' digital instruction competencies, raise school precision management levels, and promote inter-school collaboration and sharing of high-quality educational resources. In this study, we examined the prefecture's paths to developing internet- and IT-enabled minority education and described their successes to provide insight into the deep integration of information technology and education in minority regions.*

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***Correspondence to:** Jiliang Huang, Educational Technology Center, Southwest Guizhou Autonomous Prefecture 562400, Guizhou, China. E-mail: 284868738@qq.com*

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SOUTHWEST Guizhou Autonomous Prefecture is situated in the southwestern portion of China's Guizhou Province and is predominantly inhabited by Bouyei and Miao people. Due to its disadvantaged geographical and economic conditions, the prefecture's counties and districts have an extremely unbalanced education; the most pronounced issue is the significantly lower academic level of students and the poor quality of instruction of teachers in rural schools compared to those in urban schools. To alleviate poverty through education in impoverished ethnic minority areas, the educational community of the prefecture has been experimenting with new teaching, learning, and educational research models driven by the "Internet Plus" initiative and creating new avenues for minority digital education. In a bid to overcome the inter-regional, urban-rural, and inter-school education gaps, educational authorities, specialists, businesses, and other organizations have collaborated to develop high-quality online education tools for kids in rural and impoverished minority communities. This study looked into how much money Southwest Guizhou Autonomous Prefecture put into digital education for ethnic minorities and what kind of results they got. The goal was to help guide the development of high-quality primary and secondary education in minority areas.

The Status Quo of Minority Education in Southwest Guizhou Autonomous Prefecture

The Difficulty of School Enrolment and Weak Learning Awareness among Minority Students

Many ethnic minorities in Southwest Guizhou Autonomous Prefecture live in mountainous areas with harsh natural conditions and inconvenient transportation, and they continue to rely on backward production methods with low productivity. A significant proportion of families earn only a few thousand RMB per year and are barely able to support their children through primary school. Paying for their children's secondary and higher education is too much of a burden for such families, and many of them are forced to drop out (Hu, 2019).

Every ethnic minority has its own written language and Pinyin scheme, which makes it difficult for them to learn modern disciplinary knowledge, which is primarily represented in Chinese. For minority students who know little Chinese, learning Chinese entails not only learning a new pronunciation system but also accepting a new way of thinking. If the learning processes are overly complicated, teaching in Chinese may cause academic fatigue in minority students. So, the education department should move

quickly to create bilingual teaching systems for minority students so they can use their own languages to figure out what Chinese words mean.

Minority students often don't care about learning and don't realize how important school is. This is a common problem in ethnic groups that, over time, could become a bigger social problem and threaten the stable growth of minority regions and the country as a whole.

Teacher Shortages in Minority Schools

Due to their backward social development, underdeveloped economy, and low pay and compensation for teachers, minority regions have difficulty recruiting and retaining front-line teachers and normal university graduates, let alone those with excellent education backgrounds and professional levels. In minority schools, there is a high turnover of young teachers; Bianzhi (a system of publicly funded posts in China) memberships and public funds for schools are insufficient; and aging staff is an additional barrier to instruction upgrading and educational quality improvement. In some extreme cases, "all-mighty teachers" teach multiple subjects in minority schools that lack PE, music, and art teachers. Problems like these harm the quality of minority education and the overall development of students.

Despite the fact that the state has established multi-level bodies (from central to local) for minority education administration, there is no systematic minority education administration mechanism in place, resulting in an ambiguous division of responsibility. For example, some science and engineering colleges and universities in Guizhou Province have established minority student-specialized classes in recent years, but no educational authorities have attended to their operation and funding.

Minority Culture Transmission Impeded

In contrast to modern organized education, the educational methods ethnic minorities employ to convey their traditional cultures are often informal and discretionary. The majority of minority cultures are transmitted orally through national epics, folk music, production skills, and religious rites. These educational materials are natural and important to the everyday lives of minority groups, but they are rarely written down, which makes it hard to use them in textbooks (Liu, 2010).

The percentage of ethnic minority students who are skilled in their native language and culture is declining as a result of the absence of minority culture in textbooks and the popularity of Han nationality culture. The new generation of urban ethnic minorities in Southwest Guizhou Autonomous Prefecture has become indifferent to their national traditions; they are only aware of their minority identity when requested to identify their ethnicity when filling out forms. Even though there are many reasons why minority cultures are dying out, the main reason is education that focuses on the Han nationality.

The Paths of Digital Education Development in Southwest Guizhou Autonomous Prefecture

To solve the aforementioned issues, the educational community of the prefecture draws on the digital education experience of other regions and employs educational technolo-

gy to promote the modernization of minority education. Their method is also an important experiment in using digital education to help poor minority areas that are far away and have few resources.

Accelerating the Construction of Digital Facilities

The Strategic Cooperation Agreement for the Construction of Educational Big Data Cloud Platform in Southwest Guizhou Autonomous Prefecture was signed on March 2, 2016, by the National Center for Educational Technology, the Guizhou Provincial Department of Education, the People's Government of Southwest Guizhou Autonomous Prefecture, and China Telecom Guizhou Branch, ushering in the nation's public educational resource platform into the prefecture's basic education. Since then, digital infrastructure has been updated so that the prefecture's schools may make use of vast amounts of instructional data. The Jinzhou Educational Cloud Platform, which assembles top-notch online resources and apps based on cloud computing technology to offer complete services for schools, instructors, students, and parents, is the most extensively utilized big data service supported by the prefecture government. Southwest Guizhou Autonomous Prefecture has constructed a dedicated education cloud line with a bandwidth of 10G, 328 sets of live recording and broadcasting systems, 20 maker classrooms, and 26 digital laboratories in order to successfully execute the technology-powered teaching model. All elementary and secondary school students have easy access to smart teaching platforms and the internet (Huang, 2022).

Strengthening Teacher Training with the Support of Educational Technology

Southwest Guizhou Autonomous Prefecture uses educational technology to advance teacher preparation in an effort to address the uneven distribution of human resources across minority schools. Front-line anchor teachers have dedicated their time to developing "Exemplary Classrooms," or online live broadcasting classes, with the help of the Jinzhou Educational Cloud Platform in order to make top-notch courses, anchor teachers' lectures, and prestigious schools' classrooms accessible to underprivileged minority schools so that teachers in isolated locations can receive distance training on course planning and teaching methods without leaving their schools (Wei, 2017). Additionally, the prefecture's Bureau of Education launched an online mentoring program to form teaching research teams online in an effort to eliminate geographic barriers in teacher preparation. Each team uses the online platform to carry out research activities such as group lesson planning, exemplary lesson demonstration, and project-based research. Each team consists of seven senior instructors, over 20 regular teachers, and one anchor teacher. Thanks to the integration of teaching research and training, minority teachers from rural areas that aren't as well off can learn from senior and guiding teachers from other schools and improve their professional skills (Ethnic Education Development Center of China's Ministry of Education, 2022).

Encouraging Inter-School Sharing of High-Quality Educational Resources through Cyberspace

Rural education has been widely recognized as a governance weakness in the Southwest Guizhou Autonomous Prefecture, and educational disparity and inequity have been significant obstacles to its overall growth. In this context, the prefecture established the following objectives in its efforts to develop digital education: to reduce the inter-regional, urban-rural, and inter-school digital divide; to innovate new learning methods and teaching models; and to use big data platforms to collect massive quantities of high-quality educational resources. In order to foster cross-regional and inter-school collaboration, the application of the Jinzhou Educational Cloud Platform was initially tested and then widely pushed in the prefecture. Since 2019, the prefecture has implemented a series of educational technology-supported inter-school collaborative and interactive programs, such as the distance education support, anchor teacher mentoring, and resource sharing programs; a plan titled "Six Norms" has been implemented among all schools to standardize their management service, facilities construction, teaching content, teacher training, and testing and evaluation; and an intelligent assimilation system has been established to cover schools of all types, at all levels. To promote its educational association with eastern China, the prefecture utilizes IT-based platforms to establish partnerships between rural schools in Southwest Guizhou Autonomous Prefecture and schools in Ningbo City, Wuhan City, Guangdong Province, and other regions for paired partnerships and coordinated development, so that rural minority students in the prefecture can share the high-quality teaching resources in the nation's developed regions (Huang, 2022).

Modernizing School Administration

The Jinzhou Educational Cloud Platform provides information about staffing, student enrollments, and current educational resource distribution for all levels, grades, and disciplines. Educational administrators and schools in the prefecture can use this data to manage teaching, educational research, and teacher training. On the platform, school administrators can display all types of operational information, facilitating information disclosure and oversight of school operations (Liu & Liu, 2017). Using the digital platform, administrators may handle papers online, making office labor largely paperless and automated and enhancing the efficiency of school administration. Online disclosure of school curriculum development, teaching progress, tests and exams, education evaluation, as well as teacher education research and student academic quality allows schools to make changes to how they teach and how well their students do in school.

Outcomes of Digital Education in Southwest Guizhou Autonomous Prefecture

Powered by the internet and information technology, education in Southwest Guizhou Autonomous Prefecture has made great strides and maintained consistent growth in recent years. The prefecture has effectively narrowed the educational gap between ethnic minorities and Han citizens.

Upgraded Digital Facilities in the Prefecture

Southwest Guizhou Autonomous Prefecture seized the opportunity for the growth of digital education and constructed a comprehensive infrastructure by integrating the re-

sources of all parties concerned. It spent more than 5.4 million RMBs upgrading the education and teaching management software from version 6.0 to version 7.0; more than one million yuan was invested in the Third-rank Network Security Protection System (ranked protection refers to the hierarchical security protection administered to the online storage, transmission, and processing of the nation's confidential information and proprietary information of organizations, legal persons, and citizens in accordance with the National Information Security Law). In China, there are five ranks of protection. The higher the rank, the stricter the rules. The prefecture spent 2.8 million RMBs each year to move the Teaching Quality Monitoring and Diagnosis and Online Marking Systems to a cloud server so that more than 1,000 schools could be marked online at the same time (Yang, 2022).

Importantly, as a result of the successful construction of "Three Links and Two Platforms" in Guizhou Province, the digital infrastructure of the minority school in the prefecture was upgraded while the cost of the school's internet connection was drastically reduced; the school's internet connection was technically improved to ensure that a gigabit-class link was accessible on campus and that teachers had sufficient technological support for their intelligent teaching (Yu, 2022). Currently, the prefecture's educational cloud platform has a download capacity of 3T (or 3000GB), with more than 1.39 million pieces of learning materials supporting all subjects at the basic education level, nearly 16 online elective courses for general high school students, and more than 130,000 pieces of theme-based or specialized learning materials. Therefore, the online platform has become an essential learning environment where professors and students can engage in IT-enhanced teaching and learning activities. Test results reveal that the system has superior longevity and dependability, allowing for 5,000 hours of uninterrupted operation and extensive online education. More than 50,000 instructors and 700,000 students at over 1,700 schools in the prefecture benefit from a system that teaches them how to use information technology to improve teaching and learning outcomes (Huang, 2020).

Improved Academic Quality and Enrolment Rate of Minority Students

Southwest Guizhou Autonomous Prefecture's use of an educational cloud platform has altered the traditional teacher-centered instruction model and introduced new educational ideas within the framework of "Internet plus education," which has improved student learning interests and outcomes and increased teachers' awareness of teaching research. The prefecture established a task group for digital education to encourage the use of educational technology and offer technical training to all teachers and students so they can fully utilize digital resources and the internet to improve teaching and learning effectiveness. The results of a survey by Peng et al. (2019) show that after the prefecture's educational cloud platform was implemented, the experimental class at Ceheng Minority Secondary School's average score climbed by 20.23 points and its pass rate increased by 42.5%. The experimental class at Xingyi No. 3 Secondary School saw an average score rise of 9.58 points and a pass rate improvement of 21.54%. The experimental class at Zerong Secondary School saw a nearly 28-point gain in average score. The way that students learn has fundamentally changed from being "passive" to being "pro-active" at the same time.

In addition, the educational administrators of the prefecture have established an IT-assisted early-warning system through which teachers can promptly report students with a high risk of dropping out, and communities conduct comprehensive investigations of the population aged 6 to 16 to ensure that all children are retained in school and receive compulsory education. Currently, the enrollment percentage of primary school-aged children in the prefecture has risen to 99.6%, and the enrolment rate of school-aged girls has reached 99.4%; almost all junior secondary school-aged adolescents are enrolled in schools. Significant progress has been achieved by the prefecture in reducing teen illiteracy (Hu, 2019).

A Balanced Distribution of High-quality Educational Resources

Southwest Guizhou Autonomous Prefecture has developed a resource sharing model that links the urban core school with rural schools and nearby teaching sites in the same county to support educational equity based on the lessons learned from its trial projects in four cities and counties. Jinzhou Educational Cloud Platform developed online collaborative teaching patterns like the "double-teacher classroom" (taught by one on-site teacher and one online anchor teacher) independent of geographic boundaries so that students at underprivileged schools could profit from the top-notch classroom instruction of anchor teachers at prestigious institutions. Through the cloud platform, more than 300 classes in 21 regular high schools in the prefecture have used materials from esteemed institutions; online classrooms have also been used for distance learning and coaching focused on college entrance exams. As a result, between 2015 and 2017, the prefecture's overall undergraduate admissions went from 8,858 to 10,710, the rate of first-rank university admissions increased from 9.79% to 13.85%, and the number of applicants with scores above 600 rose from 255 to 459 in the same period. Additionally, a more even distribution of high-scoring applicants was seen across the prefecture (Wei, 2017). These numbers show that digital education can give kids in schools with few resources a chance to do well in school and can greatly improve educational equity in ethnic minority areas.

Educational Technology-Enabled Transmission of Minority Cultures

Minority cultures are preserved and transmitted through educational technology, which also helps them survive in the digital age. Southwest Guizhou Autonomous Prefecture employed the Jinzhou Educational Cloud Platform as the means of gathering and storing minority culture-based digital content that is intimately tied to ethnic history, customs, and festivals. From the platform, educators can acquire pertinent teaching resources regarding minority cultures and present them using multimedia. Students can master the essence of their local cultures and gain a deeper understanding of them by integrating them with the course material (Liu, 2010). Activities based on "ethnic culture" are also conducted in the platform's "Activity Square." Because of the use of online teaching materials in the classroom, students now know 116% more about their home culture and 140% more about the values of that culture (Zeng, 2019).

The prefecture's educational authorities decided to provide online training in bilingual instruction to minority instructors in response to the growing public awareness of the value of bilingual curricula. Hundreds of teachers could be trained in one session. A number of PE and music teachers at Wangmo Minority Secondary School developed innovative teaching strategies based on the theme of "Presenting Ethnic Cultures on Campus," and their studies became funded projects that resulted in dozens of articles on teaching reform. After participating in the online training, these teachers created a series of school-based bilingual textbooks. The prefecture's educational authorities uploaded top-notch multilingual teaching resources on the platform and disseminated them through multimedia teaching for those minority communities lacking access to training programs (Jiang, 2015). As a result, minority teachers' ability to teach bilingually, identify with their ethnic culture, and effectively use technology improved.

Conclusion

Southwest Guizhou Autonomous Prefecture has created a self-contained online educational system that allows teachers and students to engage in learning, training, and research at any time and in any place by utilizing the Jinzhou Education Cloud Platform. The region's educational equality and equity have been significantly improved by raising academic quality and balancing educational resources for ethnic minorities in remote and impoverished areas as a result of deep IT integration with education and coordination between online and offline instruction. Teachers' competencies in implementing internet-based digital education have significantly improved as a result of this process. In the near future, the prefecture will promote the construction of Jinzhou Education Cloud Platform's database hub and improve the digital presentation of school operations through data visualization. New ideas and methods will be developed and tested in order to improve the overall level of education quality in the prefecture and to create an internet-based education pattern with distinct characteristics. It is hoped that the prefecture's practices and experiences will give teachers in other parts of the country ideas about how to improve education using IT.

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