



The Impacts of Extramural Activities on 21st - Century Skills and English Language Motivation in Shanxi Middle School Post-China Education Reform

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Abstract

This research consists purposes were to study explores how extramural activities affect 21st century skills and English language motivation of students in Shanxi Middle School. Furthermore, the study assesses the mediating role of 21st century skills in raising students' motivation to learn English through providing students with real world language exposure and interactive learning environment. The objectives are as follows: 1) To study the impacts of extramural activities to increase 21st – century skills and English language motivation. 2) To study the mediating effects of 21st- century skills between the use of extramural activities and English language motivation. In quantitative analysis, 400 respondents that were chosen through stratified sampling and analyzed through AMOS and SPSS. A pilot study with 30 participants Results: 1) The findings were found to confirm that involvement in extracurricular activates has significant impact on students' motivation to learn English as well as improvement of essential cognitive and interpersonal skills. The study also emphasizes that in order to bring structured extracurricular programs into formal education, reform of the curriculum, institutional support and teacher training is key. 2) This finding indicates that extracurriculars do more than add on, they are great learning tools that help students obtain skills needed to use language effectively and help it be retained in the long term. Additionally, the research shows that students with 21st century skills developed in extramural activities are more intrinsically motivated for the language learning. Collaboration, critical thinking and using English in a dynamic environment are all way to make learning more immersive, relevant and impactful.

Keywords: Extramural Activities, 21st-Century Skills Development, English Language Motivation



Introduction

In the context of globalization today, education systems across the globe and specifically students, are faced with challenges of offering learning that encompasses the core qualities and demands of the 21st century education (Gonzalez-Perez and Ramirez-Montoya, 2022) Increased globalization, technological development and integrating economies call for the workforce to be more than just producers of knowledge retention but producers that think critically, are creative, collaborative and communicate effectively (Muzam, 2023) All these competencies are not so much extra nowadays but necessary skills to address real problems of globalization. Therefore, peculiar objectives of education institutions change moving towards combination of the classical point of imparting knowledge, and inculcating such new-type skills. This change in education's development involves mixing the student for both career maturity as well as for social responsibility in a dynamic and plural global society.

Likewise in the present world English has come up as the medium in communication, research and commerce and hence also boosts the utility of English as an international language. English as the medium of communication to access numerous opportunities, however, the challenge that educators face is, how to make the students learn English. (Shanxi Provincial Department of Education, 2023) In response to global influences, China's system has undergone significant changes, because the state wants Chinese education to meet the challenges of the world After the economic reform in the late 1970s, China started the process of scaling up the quality of education as an important part of its development strategy. This shifts from drill like learning methods and the banking model of education that focused primarily on reproductive learning and classroom assessment gradually transformed as the results of serious attempts to foster creativity, (Albayrak & Sener, 2021) critical thinking and problem-solving skills. This shift departed with most pedagogy strategies that were existing for a long time, and the nation aimed at preparing learners for national competitiveness and international competitiveness. Education in English language can be identified as one of the major reforms because English has become an important language for business, (Liao, W., Zeng, F. and Chanieabate, M., (2022) commerce and education all over the world (Xie, 2021) In response the China, significant efforts were made in the improvement of the quality of the English language teaching; this was through providing means such as teacher education, production of contemporary materials in English and setting of specialized educational institutions. Such endeavours are a clear indication that the government of China understood the importance that English language as a tool of world integration and as means encouraging Chinese learners and employees to be the active members of the international community. (Peters et al., 2020) These reforms have enabled Chinese



education system to produce globally relevant human capital as way of countering global challenges in training education systems for the needed qualification.

This study has become relevant because the trend towards adapting education systems to globalization of economies and societies is progressive globally. The alternative is modernization of education in an effort to retain cultural beliefs in education in China has been compounded by numerous challenges within the country especially in areas like Shanxi. (Bach and Kenley, 2023) Here we see that educational values tradition and at the same time innovation, therefore education is the means for conserving the value and at the same time economic growth. Extramural here stands a key means through which this balancing is accomplished by enhancing the students' learning by availing to them exposures which are practical in nature and which help complement existing classroom-based theory. (Odell et al., 2020) This study, therefore, does not only capture their direct effecting on students' skills, motivation but also offers a view of how education systems globally could improve on to prepare citizens for the challenges of the 21st century.

The Purposes

1. To study the impacts of extramural activities to increase 21st - century skills and English language motivation.
2. To study the mediating effects of 21st- century skills between use of extramural activities and English language motivation.

Literary Review

The literature reviews the relevant studies regarding Chinese middle school education, extramural activities, 21st century skills and English language motivation with central theories. It briefly summarizes the findings of previous research, identifies and critiques gaps in the literature and prepares theoretical foundation for the study. Likewise, the third chapter research methodology describes the qualitative and quantitative research design with sampling methods (purposive, and stratified), the development of questionnaire, pilot study, reliability tests and data collection using QQ, and WeChat. The methodology for the study involves content analysis and AMOS and SPSS for quantitative analysis. Research integrity would avoid ethical considerations in addition to its structure.



Methodology

1. Population and sample groups in the research include: This study employs a quantitative analysis to explore the relationship between the use of extramural activities to increase 21st century skills and English language motivation. The population of the study is 1,093,643 participants (Shanxi Provincial Department of Education, 2023) who are middle school students (aged between 12 and 15 years old) in Shanxi Province. Using Yamane's formula (Yamane, 1973) with a 5% margin of error, the sample size for this study has been calculated to be approximately 400 middle school students (aged between 12 and 15 years old) in Shanxi Province.

2. Research tools include: The indicators of use of extramural activities are: debate clubs, drama or theater activities, sports and team building exercises and language exchange programs. The indicators of English language motivation are: intrinsic motivation, extrinsic motivation, behavioral motivation, affective motivation and goal orientation. The indicators of 21st century skills are critical thinkers, collaborations, self-directed learners, environmental conscious, global citizens, AI literate and adaptive and resilient. The sample size for the pilot study was 30 Whitehead et al. (2016) where 15 male participants and 15 female participants middle school students (aged between 12 and 15 years old) from diverse educational and cultural backgrounds in Shanxi Province.

3. Data collection: The data was collected from middle school students (aged between 12 and 15 years old) in Shanxi Province. The online questionnaire was done by using question star and data collected through QQ and WeChat. AMOS 24 software is used for any hypothesis testing in order to accept or reject the hypothesis and to look at the direct and indirect impact, SPSS is used for the demographic items and descriptive analysis.

4. Data Analysis: Combine quantitative and qualitative data analysis methods, including descriptive statistics, inferential statistics, content analysis and thematic coding, to process and interpret the data. We will use statistical software to conduct descriptive and inferential statistical analysis on quantitative data

5. Statistical used in research: To understand the basic characteristics and distribution of the sample. And will collect data through questionnaire surveys and in-depth interviews to ensure the diversity and representativeness of the sample. We will distribute questionnaires online and offline and arrange in-depth interviews to collect specific data and

Results

This Research The researcher can classify the research results as follows

1. To study the impacts of extramural activities to increase 21st - century skills and English language motivation

1.1 Confirmatory Factor analysis

The result for the confirmatory factor analysis is shown in table and figure.

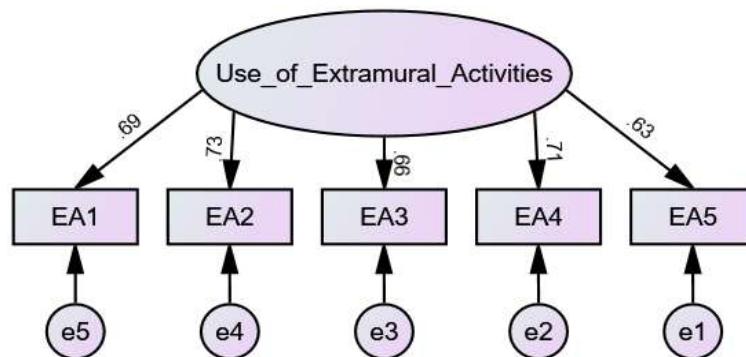


Figure 1 Confirmatory factor analysis of Use of Extramural Activities (Yutong Zhao, 2025)

Source: Data and information from this research

In figure 1 confirmed that Use of Extramural Activities component variables (EA1 to EA5) show standardized loadings between 0.63 and 0.73 which establishes a robust tie to the latent construct. The component EA2 has the highest loading demonstrates the strongest connection to the construct (0.73) while EA5 has the lowest loading shows the weakest connection at 0.63. The constructs display excellent validity because all measurements surpass 0.60 confirming that observed factors adequately represent the underlying construct of Use of Extramural Activities. The table 2 shows that Chisq/df is 1.100 which is less than 5.0 and GFI, CFI, IFI is 0.995, 0.999, 0.999 which is greater than 0.9, RMSEA value is 0.016 which is between 0.05 to 0.08, so this indicate that the model is suitable for fit.

Table 1 Model fit of Use of Extramural Activities

Index	Accepted value	Value
Chisq/df	<5.0	1.100
GFI	0.9	0.995
CFI	0.9	0.999
IFI	0.9	0.999
RMSEA	0.05 to 0.08 or less	0.016

Source: Data and information from this research

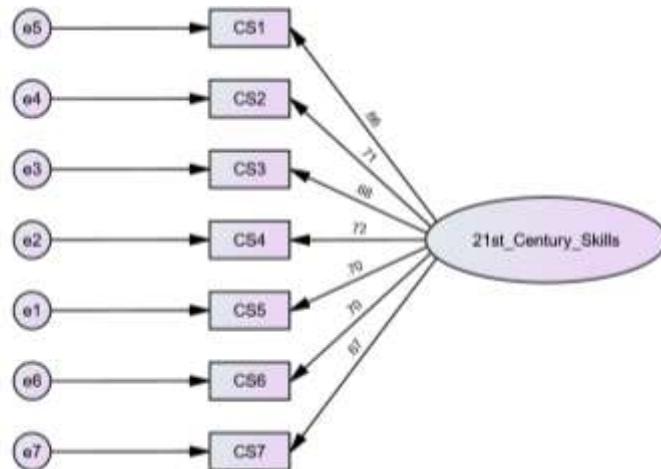


Figure 2 Confirmatory factor analysis of 21st Century Skills (Yutong Zhao, 2025)

Source: Data and information from this research

In figure 2 conducted on 21st Century Skills confirmed seven subscales (CS1 and CS7) feature standardized factor loadings between 0.66 and 0.72 demonstrating robust contributions to the underlying construct. Developmental Confirmation Analysis results demonstrate CS4 exhibits the strongest association to the construct at 0.72 while maintaining acceptable value for CS1 at 0.66. The observed variables demonstrate reliable measurement of 21st Century Skills because all factor loadings exceed the cut-off value of 0.60. The table 3 shows that Chisq/df is 0.577 which is less than 5.0 and GFI, CFI, IFI is 0.994, 1.000, 1.006 which is greater than 0.9, RMSEA value is 0.000 which is between 0.05 to 0.08, so this indicate that the model is suitable for fit.

Table 2 Model fit of 21st Century Skills

Index	Accepted value	Value
Chisq/df	<5.0	0.577
GFI	0.9	0.994
CFI	0.9	1.000
IFI	0.9	1.006
RMSEA	0.05 to 0.08 or less	0.000

Source: Data and information from this research

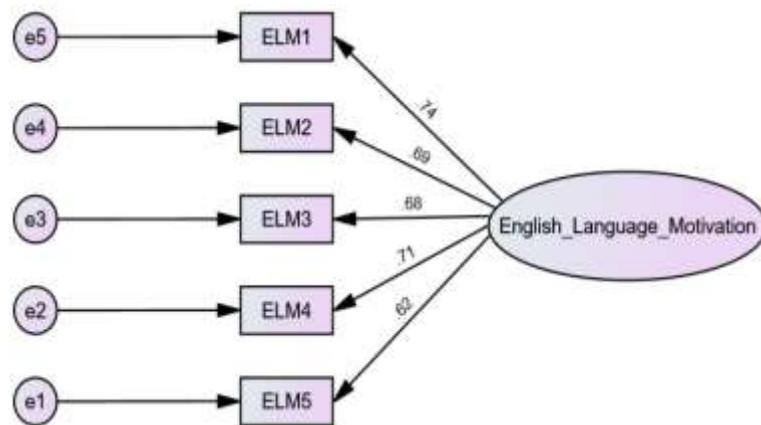


Figure 3 Confirmatory factor analysis of English Language Motivation (Yutong Zhao, 2025)

Source: Data and information from this research

The English Language Motivation Construct validity is demonstrated by Figure 3 which shows standardized factor loadings between 0.62 and 0.74 for the five subscales ELM1 to ELM5. Factor analysis of ELM1 exhibits the strongest load of 0.74 and ELM5 shows the lowest loading of 0.62 but still fulfills standard thresholds. The observed variables successfully represent the English Language Motivation construct through standardized factor loadings that exceed 0.60. The table 4 shows that Chisq/df is 1.806 which is less than 5.0 and GFI, CFI, IFI is 0.992, 0.993, 0.994 which is greater than 0.9, RMSEA value is 0.045 which is between 0.05 to 0.08, so this indicate that the model is suitable for fit.

Table 3 Model fit of English Language Motivation

Index	Accepted value	Value
Chisq/df	<5.0	1.806
GFI	0.9	0.992
CFI	0.9	0.993
IFI	0.9	0.994
RMSEA	0.05 to 0.08 or less	0.045

Source: Data and information from this research

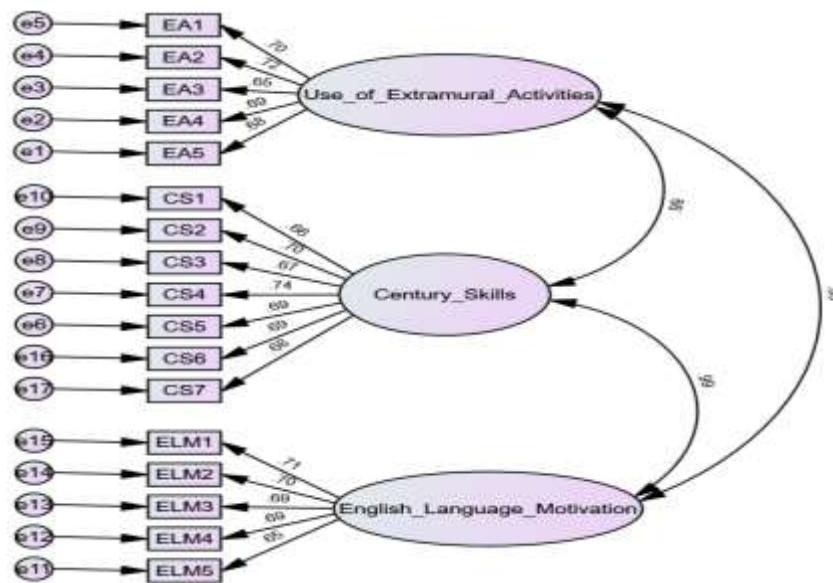


Figure 4 Overall Confirmatory factor analysis (Yutong Zhao, 2025)

Source: Data and information from this research

The table 5 shows that Chisq/df is 0.995 which is less than 5.0 and GFI, CFI, IFI is 0.967, 1.000, 1.000 which is greater than 0.9, RMSEA value is 0.000 which is between 0.05 to 0.08, so this indicate that the model is suitable for fit.

Table 4 Model fit of Overall Variables

Index	Accepted value	Value
Chisq/df	<5.0	0.995
GFI	0.9	0.967
CFI	0.9	1.000
IFI	0.9	1.000
RMSEA	0.05 to 0.08 or less	0.000

Source: Data and information from this research

1.2 Demographic Information

The total number of male respondents are 236 (59.0%) which is followed by female respondents which is 164 (41.0%) respectively. The higher number of age respondents are 13 – 14 years which is 124 (31.0%) followed by the age between 11 - 12 years has respondents 114 (28.5%) and the age of 14 - 15 years has respondents 86 (21.5%) and the age of 12 - 13 years has respondents 76 (19.0%) respectively. The higher



number of respondents grade is grade 8 which is 144 (36.0%) followed by grade 7 which is 129 (32.3%) and grade 9 which is 127 (31.7%). The higher number of respondents duration of study English is 3 to 5 years which is 204 (51.0%) followed by less than 3 years which is 103 (25.7%) and duration more than 5 years is 93 (23.3%) respectively. The participation in extramural activities of respondents which has a higher number is weekly which is 157 (39.2%) followed by daily which is 139 (34.8%) and occasionally which is 104 (26.0%) respectively.

1.3 Descriptive Analysis

In this analysis it consists of mean and standard deviation of the components in the study. The descriptive analysis outcome for use of extramural activities in shown in table 6.

Table 5 Mean and standard deviation of use of extramural activities

Variables	Mean	Std. Deviation	Rank
Debate Clubs (EA1)	4.20	0.925	2
Drama or theatre activities (EA2)	4.10	0.897	4
Sports and team building exercise (EA3)	4.17	0.959	3
Community service projects (EA4)	4.04	0.939	5
Language exchange programs (EA5)	4.21	0.959	1
Total	4.14	0.710	

Source: Data and information from this research

From table 5 shows the variables, mean, standard deviation and rank for use of extramural activities. The higher rank of use of extramural activities is EA5 which has a mean value of 4.21 and standard deviation of 0.959 followed by EA1 which has a mean value of 4.20 and standard deviation of 0.925. EA3 which has a mean value of 4.17 and standard deviation of 0.959, EA2 which has a mean value of 4.10 and standard deviation of 0.897 and EA4 which has a mean value of 4.04 and standard deviation of 0.939 respectively. The descriptive analysis outcome for 21st Century Skills in shown in table 7.

Table 6 Mean and standard deviation of 21st Century Skills

Variables	Mean	Std. Deviation	Rank
Critical Thinkers (CS1)	4.28	0.880	1
Collaborations (CS2)	4.12	0.917	5
Self-directed Learners (CS3)	4.16	0.984	4
Environmental Conscious (CS4)	4.03	0.997	7
Global Citizens (CS5)	4.17	0.964	3

AI Literate (CS6)	4.09	0.949	6
Adaptive and Resilient (CS7)	4.21	0.931	2
Total	4.15	0.703	

Source: Data and information from this research

From table 6 shows the variables, mean, standard deviation and rank for 21st Century Skills. The higher rank of 21st Century Skills is CS1 which has a mean value of 4.28 and standard deviation of 0.880 followed by CS7 which has a mean value of 4.21 and standard deviation of 0.931. CS5 which has a mean value of 4.17 and standard deviation of 0.964, CS3 which has a mean value of 4.16 and standard deviation of 0.984, CS2 which has a mean value of 4.12 and standard deviation of 0.917. CS6 which has a mean value of 4.09 and standard deviation of 0.949 and CS4 which has a mean value of 4.03 and standard deviation of 0.997. The descriptive analysis outcome for English Language Motivation in shown in table 8.

Table 7 Mean and standard deviation of English Language Motivation

Variables	Mean	Std. Deviation	Rank
Intrinsic Motivation (ELM1)	4.19	1.005	2
Extrinsic Motivation (ELM2)	4.11	0.925	4
Behavioral Motivation (ELM3)	4.21	0.972	1
Affective Motivation (ELM4)	4.08	0.922	5
Goal Orientation (ELM5)	4.17	0.985	3
Total	4.153	0.732	

Source: Data and information from this research

From table 7 shows the variables, mean, standard deviation and rank for English Language Motivation. The higher rank of English Language Motivation is ELM3 which has a mean value of 4.21 and standard deviation of 0.972 followed by ELM1 which has a mean value of 4.19 and standard deviation of 1.005. ELM5 which has a mean value of 4.17 and standard deviation of 0.985, ELM2 which has a mean value of 4.11 and standard deviation of 0.925 and ELM4 which has a mean value of 4.08 and standard deviation of 0.922 respectively.

1.4 Path Analysis

The statistical technique of path analysis functions to analyse relationships between multiple variables found in models. The path analysis is shown in figure 5.

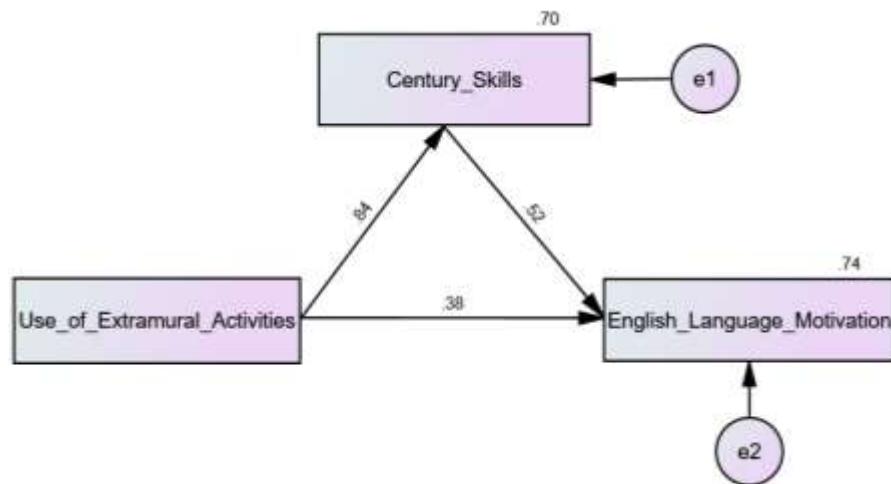


Figure 5 Path analysis (Yutong Zhao, 2025)

Source: Data and information from the research the direct effect from the path analysis is shown in table 10.

Table 9 Direct Effect

Direct path analysis	Standardized Regression	Standard Error	T-Value	P-Value
Use of Extramural Activities--> 21st Century Skills	0.835	0.027	30.509	***
21st Century Skills--> English Language Motivation	0.519	0.048	11.188	***
Use of Extramural Activities--> English Language Motivation	0.377	0.048	8.126	***

Note: ***p<0.001

In table 9 shows the direct path analysis where the direct analysis is between Use of Extramural Activities and 21st Century Skills. In this analysis shows that students who participate more actively in extra-school activities develop advanced 21st-century skills based on their strong positive relationship indicated by the standardized regression coefficient (0.835). The P-value shows *** ($p < 0.001$) indicating an extremely significant between extramural activities and development of 21st-century skills. From this analysis it shows that the hypothesis (H1) extramural activities have positive and significant impact on 21st century skills is accepted.

Similarly, in table 11 shows that the direct analysis is between 21st Century Skills and English Language Motivation. The standardized regression coefficient demonstrates that learners with advanced 21st-century skills demonstrate greater motivation to acquire English since the relationship is positive which is 0.519. Research demonstrates a strong significant relationship between English language motivation level increases and the development of 21st-century skills based on the P-value shows *** ($p < 0.001$). From this analysis it shows that



the hypothesis (H2) 21st century skills have positive and significant impact on English language motivation is accepted.

and also, in table 11 shows that the direct analysis is between Use of Extramural Activities and English Language Motivation. In this analysis standardized regression coefficient set at 0.377 confirms an average strength of association which demonstrates that extramural activities help improve learning motivation for English. The findings showing *** ($p < 0.001$) demonstrate a powerful significant connection which confirms extramural tasks enhance English language motivation. From this analysis it shows that the hypothesis (H3) extramural activities have positive and significant impact on English language motivation is accepted.

1.5 Mediating Effect

A mediating effect indicates an indirect influence which arises from the mediating variable's complete or nearly complete explanation of relationships among independent and dependent variables. The indirect effect of the study is shown in table 10

Table 10 Indirect Effect Path Analysis

Indirect path analysis	Standardized Regression	Lower	Upper	P-Value
Use of Extramural Activities--> 21st Century Skills--> English Language Motivation	0.433	0.377	0.530	***

Source: Data and information from this research

In table 10 shows the indirect path analysis, it evaluates the mediating effect of 21st Century Skills in the relationship between Use of Extramural Activities and English Language Motivation. Participation in extramural activities leads to moderately enhanced 21st-century skills which creates positive motivation to learn English according to the standardized coefficient (0.433). In this study shows that $p < 0.001$ (***) indicating a strongly significant indirect relationship. From this analysis it shows that the hypothesis (H4) 21st century skills mediate the relationship between use of extramural activities and English language motivation is accepted.

1.6 Coefficient of Determination (R^2)

The value of r square value of $R^2 < 0.19$ is considered weak; $0.19 \leq R^2 < 0.33$ is considered as weak; $0.33 \leq R^2 < 0.67$ is considered as moderate; $R^2 \geq 0.67$ is considered as substantial. The study shows that the value of R^2 of 21st Century Skills is 0.70 and English Language Motivation is 0.74. which is considered as substantial. This indicate that the independent variable has a 70% variance in 21st Century Skills and 74% variance in English Language Motivation.



2. To study the mediating effects of 21st- century skills between use of extramural activities and English language motivation

The shows that extramural activities strongly boost students' development of 21st-century competencies and enhance their motivation in learning English. The research data demonstrates that students who join extracurricular activities involving debates and drama scroll groups while taking part in language clubs and cultural visits develop excellent abilities in communication and collaboration together with critical thinking along with adaptability skills. The study demonstrates how real-life scenarios help students practice their English skills and build up their enthusiasm for mastering the language. The research results confirm that out-of-school activities lead to the creation of fundamental abilities necessary for the twenty-first century. Experimental learning methods and activities linking abstract subject knowledge to real-world practice show that extramural participation delivers strong results which the research validates. And also, the students who take part in extramural activities develop stronger intrinsic motivation toward learning English. Students rate English more useful and interesting when they encounter it in dynamic environments which move beyond conventional classrooms.

This research confirms that extramural activities both enhance 21st-century learning skills and increase English language motivation. The result show explicit significance for educational institutions to integrate planned extracurricular programs within their language learning curriculum. The 21st century requires educational institutions and policymakers and educators to promote extramural activities as essential elements for complete student growth because they enhance student development.

it shows that English language motivation is mediated by 21st century skills when extramural activity is a mediator of its relationship. The findings clearly confirm that extramural activities not only promote English language learning, but also greatly assist development of critical the skills necessary for 21st Century lives, and these in turn bolster motivation to study the language. Unfortunately, the results show that if a child has the beginning ratios of active participation of extracurricular activities such as debate clubs, language exchange programs, drama, and public speaking, they develop critical thinking, collaboration, creativity, and communication skills, ultimately all leading to their engagement and enthusiasm towards learning English. In addition, the study validates those extramural activities relate to 21st-century skills as a mediating between extramural activities and language motivation. Students who have good problem-solving skills, adaptable, leadership and teamwork displayed higher level of confidence in language acquisition and real-world application. This finding indicates that extracurriculars do more than add on, they are great learning tools that help students obtain skills needed to use language effectively and help it be retained in the long term.



Additionally, the research shows that students with 21st century skills developed in extramural activities are more intrinsically motivated for the language learning. Collaboration, critical thinking and using English in a dynamic environment are all way to make learning more immersive, relevant and impactful. For instance, students who go through these activities will have their 21st century skills improved and hence develop a stronger and self-driven motivation to improve their English skills.

Conclusion

The conclusion according to the objectives are

1. The findings were found to confirm that involvement in extracurricular activates has significant impact on students' motivation to learn English as well as improvement of essential cognitive and interpersonal skills. The study also emphasizes that in order to bring structured extracurricular programs into formal education, reform of the curriculum, institutional support and teacher training is key.
2. This finding indicates that extracurriculars do more than add on, they are great learning tools that help students obtain skills needed to use language effectively and help it be retained in the long term. Additionally, the research shows that students with 21st century skills developed in extramural activities are more intrinsically motivated for the language learning. Collaboration, critical thinking and using English in a dynamic environment are all way to make learning more immersive, relevant and impactful.

Discussion

This Research The researcher can discuss the research results as follows

1. In this study it shows extracurricular activities are important for acquiring 21st-century abilities because they promote critical thinking, teamwork, and adaptability. Sports and theatre foster creativity, cooperation, and resilience, while debate clubs improve communication and problem-solving skills. The result is in line with Extramural engagement improves essential 21st-century abilities which include communication competencies and teamwork development and problem-solving and leadership capabilities.
2. In this study acquisition of 21st-century skills enhances learner English language motivation because students develop improved critical thinking skills along with enhanced collaboration skills and flexibility in diverse learning environments. The result is in line with the development of 21st-century abilities enhances student motivation in learning English through their improved critical thinking and better collaboration and adaptability skills. And In this study English language motivation receives positive effects from extramural experiences because these activities create practical opportunities to use language in meaningful contexts and



enable students to experience intrinsic and extrinsic motivation through purposeful learning that brings enjoyment. The result is consistent with enrolment in extracurricular activities produces positive English learning attitude developments in students since these activities offer authentic opportunities to practice the language.

Discoveries or New Knowledge

Students with 21st century skills developed in extramural activities are more intrinsically motivated for the language learning. Collaboration, critical thinking and using English in a dynamic environment are all way to make learning more immersive, relevant and impactful. For instance, students who go through these activities will have their 21st century skills improved and hence develop a stronger and self-driven motivation to improve their English skills.

Suggestion

1. Suggestions for use

- 1.1 Promote confidence in language learning and real-world application at a higher level.
- 1.2 Develop a curriculum that addresses 21st-century skills, building on extracurricular activities to foster intrinsic motivation for language learning, collaboration, critical thinking, and the use of English in a dynamic environment.
- 1.3 Students participating in activities based on this study are expected to develop enhanced 21st-century skills, resulting in stronger motivation and self-motivation to further develop their English language skills.

2. Suggestions for next research

Research should be conducted to identify ways in which English can be used in a dynamic environment, making learning more realistic, relevant, and powerful language in meaningful contexts and enable students to experience intrinsic and extrinsic motivation through purposeful learning that brings enjoyment. The result is consistent with enrolment in extracurricular activities produces positive English learning attitude developments in students

References

Albayrak, H., and Şener, T. (2021). The relationship between participation in extracurricular activities and motivation of foreign language learning. *International Journal of Psychology and Educational Studies*, 8(2), 122-132.



Bach, J., and Kenley, D. (2023). Educational Crisis in Shanxi: An Analysis of Brethren Mission Schools in Republican China. *In From Missionary Education to Confucius Institutes (pp. 101-116)*. Routledge.

Gonzalez-Perez, L. I., and Ramirez-Montoya, M. S. (2022). Components of Education 4.0 in 21st century skills frameworks: systematic review. *Sustainability*, 14(3), 1493.

Liao, W., Zeng, F., and Chanieabate, M. (2022). Mechanization of small-scale agriculture in China: Lessons for enhancing smallholder access to agricultural machinery. *Sustainability*, 14(13), 7964.

Muzam, J. (2023). The challenges of modern economy on the competencies of knowledge workers. *Journal of the Knowledge Economy*, 14(2), 1635-1671.

Odell, V., Molthan-Hill, P., Martin, S., and Sterling, S. (2020). *Transformative education to address all sustainable development goals*. Quality education, 905-916.

Peters, M. A., Wang, H., Ogunniran, M. O., Huang, Y., Green, B., Chunga, J. O. and Hayes, S. (2020). China's internationalized higher education during Covid-19: Collective student autoethnography. *Postdigital science and education*, 2, 968-988.

Shanxi Provincial Department of Education (2023). *Education Statistics in Shanxi Province*. Shanxi Provincial Department of Education.

Xie, Q. (2021). Applying vocational education and training pedagogy in business English courses for China's English major undergraduates. *Education+ Training*, 63(2), 292-312.