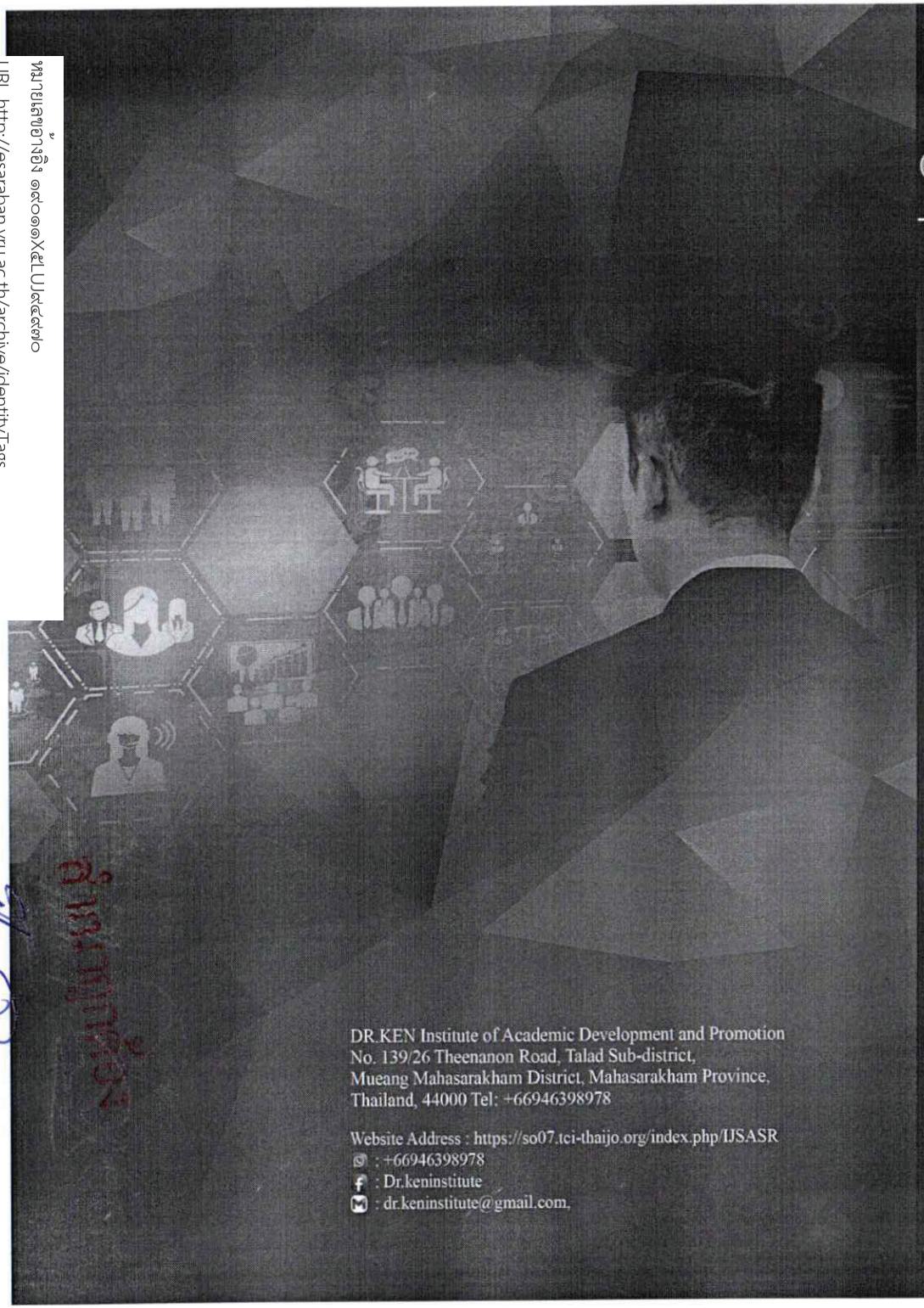


DR.KEN Institute of Academic Development and Promotion
No. 139/26 Theenanon Road, Talad Sub-district,
Mueang Mahasarakham District, Mahasarakham Province,
Thailand, 44000 Tel: +66946398978

Website Address : https://so07.tci-thaijo.org/index.php/IJSASR
: +66946398978
: Dr.keninstitute
: dr.keninstitute@gmail.com,

International Journal of Sociologies and Anthropologies Science Reviews (IJSASR)

# International Journal of Sociologies and Anthropologies Science Reviews (IJSASR)

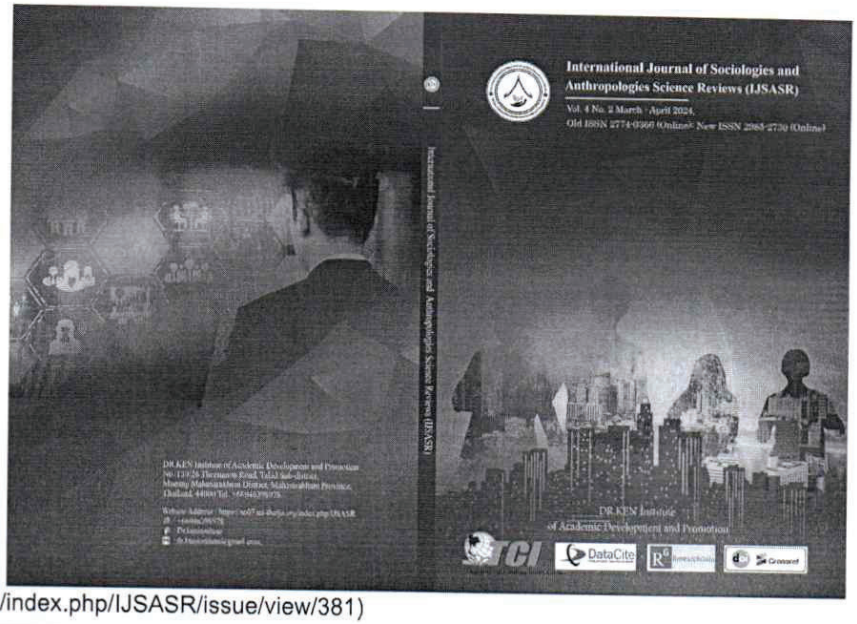
Vol. 4 No. 2 March - April 2024,
Old ISSN 2774-0366 (Online): New ISSN 2985-2730 (Online)

DR.KEN Institute
of Academic Development and Promotion

Thai Journal Citation Index Center

International Journal of Sociologies and Anthropologies Science Reviews+IJSASR+ 2774-0366 +DR.KEN Institute of Academic Development and Promotion






(https://so07.tci-thaijo.org/index.php/IJSASR/issue/view/381)

**Published:** 2024-03-01

Articles

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3751/2828)

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3870/2845)



Development Program of Basic Physical Movement Skills for Early Childhood in Guangzhou City, China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3772)
Xiaomiao Sheng , Pattarapon Maharkan
201-218
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3772/2846)

Research on the Status Quo and Strategies of Chinese Education in Primary and Secondary Schools in Thailand (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3564)
Dong Xiao, Chunlai Tian
219-224
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3564/2847)

Study on Kinematic Characteristics of Tennis Serve Technology under Different Serving Modes (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3871)
Guang Shi
225-240
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3871/2848)

The Development of Specific Training Programs to Improve the Speed, Agility, Quickness, and Pass-Receiving Performance of Soccer Players (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3855)
Tong Hui, Wisute Tongdecharoen, Nopporn Tasnaina
241-250
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3855/2849)

The Relationship Between Personnel Development and Employee Performance at Zhuoyue Human Resources Service Co. LTD., Hohhot, People's Republic of China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3841)
Shiqing Han, Watcharin Sutthisai
251-270
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3841/2850)

Folk Elements Compilation in Chinese Textbooks for Thai Elementary Schools (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3831)
Zhao Dong, Zhiyan Li
271-278
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3831/2851)

Exploring the Narrative and Aesthetic Aspects of Huanglong Opera in Nong'an County Jilin Province China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3930)
Qianqian Liu, Jarernchai Chonpairot
279-288
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3930/2852)

Anthropological Perspectives on the Historical Development of Salar Folk Songs in Qinghai Province, China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3965)
Xiuhong Luo, Tawanchai Suanmonta
289-298
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3965/2853)

The Effects of Blockchain Technology Adoption on Business Ethics and Social Sustainability: Evidence from Chinese FinTech Companies (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3932)
Wenbo Yu
299-308

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3932/2854)



The Historical Process and Deep Influence of Sino-Thai Educational Intermingling—A Case Study on Yunnan Context (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3985)
Peng Xu, Yinsheng Li
309-326
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3985/2855)

An Anthropological Analysis of He Peng's Works and Transmission in Bayin Zuochang National Music Art Education (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3994)
Yan Guo, Khomkrich Karin
327-342
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3994/2856)

Sustainable Career Development of Nursing Graduates in Higher Vocational Colleges: A Case Study of Weifang Nursing Vocational College (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3955)
Peng He, Walaiporn Chaya, Suthin Rojprasert
343-356
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3955/2857)

The Effect of teaching a Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism Theory to Enhance Mathematics Logical Reasoning Ability for First Year Students of Xi'an University (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3948)
Qin Wei, Suwana Juithong, Wassaporn Jirojphan, Pimlak Moonpo
357-366
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3948/2858)

The Contemporary Status of Pingxian Folk Songs and Their Educational Significance in Qinghai Province Through Anthropological Analysis (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4013)
Jing Yang, Suthasinee Theerapan
367-378
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4013/2859)

A Guzheng Musical Aesthetic on "Hai Zhi Bolan" based on Chinese Aesthetic Education (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4020)
Yuchen Du , Thanyawat Sondhiratna, Ampaipan Kaosawang
379-384
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4020/2860)

A Development of Athletes Towards Excellence Model for Chinese Table Tennis Association (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4015)
Zongjue Ma, Suvachai Rittisom
385-396
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4015/2861)

A Developing Competency of High-School Physical Education Teacher Model in Eastern Guangdong Province (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3997)
Ling Qin , Rumpai Soonjan
397-406
PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3997/2872)

A Development of the Teaching Plan on Flower Ball Cheerleading in Physical Education Course to Improve Physical Fitness and Mental Health for Primary School Students (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4008)
Mengjiao Wang , Yurasin Wattanapayungkul

407-416

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4008/2873)



Empirical Determinants of Research and Development (R&D) Investment in Chinese Manufacturing Companies (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3983)

Yang Li
417-424

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3983/2874)

A Managerial Development Model for Promoting Elite Futsal Players at University (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4005)

Zhiyan Zeng, Chanchai Siriphan
425-436

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4005/2875)

THE The Management Strategies to Develop Physical Exercise for Secondary School Students in Industrial Zone of Shaanxi Province, The People's Republic of China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4096)

Boyu Lin, Wanit Nirantranon, Chanchai Siriphan
437-450

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4096/2876)

High-quality Development Model of Industrial Integration of Sports Characteristic Towns in Northeast China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3999)

Zhiliang Song , Nopporn Tasnaina
451-466

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/3999/2877)

The Development Process of Qinghai Mongolian Folk Songs Through Anthropological Perspectives (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4148)

Qin Han, Peerapong Sensai
467-476

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4148/2878)

Guideline of Integration Flipped Classroom and Peer Teaching Method and Peer Teaching Method to Improve the Tennis Learning Outcome of Students at Wuhan Sports University, People's Republic of China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4046)

Xinran Yang , Yurasin Wattanapayungkul
477-484

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4046/2879)

Development of Male Soccer Training Model for Primary School Students in Guangzhou City (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4099)

Tianfu Cao, Prakit Hongsaenyatham, Chanchai Siriphan
485-498

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4099/2880)

A development Management Process to implement smart Sports in Higher Education Institutions in Heilongjiang Province, the People's Republic of China (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4084)

Han Guo, Prakit Hongsaenyatham, Chanchai Siriphan
499-514

PDF (https://so07.tci-thaijo.org/index.php/IJSASR/article/view/4084/2881)

Journal Information


Approved by TCI during 2022 - 2024

(/public/api/infoTier.php)

Indexed in TCI (https://tci-thailand.org/list%20journal.php)

TCI Thai-Journal Citation Index Center (https://tci-thailand.org/detail_journal.php?id_journal=11720)

Cite (https://commons.datacite.org/doi.org?query=DR.KEN)

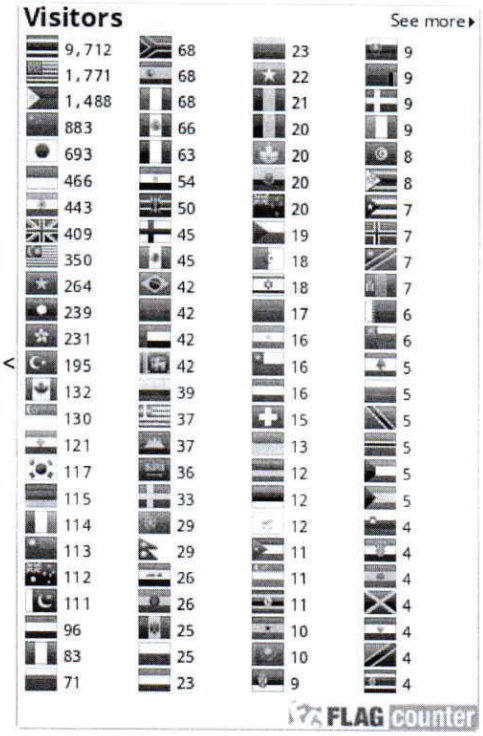
doi Crossref (https://search.crossref.org/?from_ui=yes&q=International%20Journal%20of%20Sociologies%20and%20Anthropologies%20Science%20Reviews)

ISSN INTERNATIONAL STANDARD SERIAL NUMBER UNITED STATES (https://portal.issn.org/resource/ISSN/2985-2730)

Google scholar (https://scholar.google.com/citations?hl=th&user=5mJsfooAAAAJ)

ResearchGate (https://search.yahoo.com/search?p=ISSN%20%222985-2730%22)

Editor: Asst. Prof. Dr. Sanya Kenaphoom




(https://info.flagcounter.com/uXIg)

DR.KEN Institute of Academic Development and Promotion.
No. 139/26 Theenanon Road, Talad Sub-district, Mueang Mahasarakham District,
Mahasarakham Province, Thailand, 44000 Tel: +66946398978.
Email: dr.keninstitute@gmail.com
Facebook: https://www.facebook.com/Dr.keninstitute

# The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University

**Qin Wei[1], Suwana Juithong[2], Wassaporn Jirojphan[3], Pimlak Moonpo[4]**

[1] Doctoral student, Curriculum and Instruction Program, Valaya Alongkron Rajabhat University under the Royal Patronage Pathum Thani Province, Thailand

[2,3,4] Curriculum and Instruction Program, Valaya Alongkron Rajabhat University under the Royal Patronage Pathum Thani Province, Thailand

E mail: 258196701@qq.com

E-mail: suwana@vru.ac.th

E-mail: wassaporn @vru.ac.th

E-mail: pimlak@vru.ac.th

**Abstracts**

**Background and Aim:**

This study explores the integration of Small Private Online Courses ( SPOC) and Constructivism theory to enhance students' mathematical logical reasoning skills, focusing on elementary number theory. Specifically, it aims to: 1) Compare students' mathematical logical reasoning ability before and after SPOC implementation. 2) Evaluate student satisfaction with the SPOC on elementary number theory.

**Materials and Methods:**

The study involved 80 first-year Mathematics major students at Xi'an University, with a sample of 40 selected via cluster random sampling. Pre-test and post-test assessments were conducted using Mathematics Logical Reasoning Ability tests. Data analysis included mean scores, standard deviation, correlation, and t-tests. Research instruments included SPOC lesson plans, logical reasoning tests, and satisfaction questionnaires.

**Results:**

Post-test scores showed a significant increase in mathematical logical reasoning ability compared to pre-test scores (pretest mean: 19.48, post-test mean: 22.55, $p < .05$). Additionally, students reported high satisfaction with the SPOC on elementary number theory (Mean = 4.58, SD = 0.52).

**Conclusion:**

Integrating SPOC with Constructivism theory effectively improves students' mathematical logical reasoning abilities, as evidenced by higher post-test scores. Moreover, students express high satisfaction with this instructional approach.

**Keywords**:

Small Private Online Course (SPOC) , Constructivism theory, Mathematics Logical Reasoning Ability

## 1.Introduction

The integration of Small Private Online Courses (SPOC) on Elementary Number Theory, grounded in Constructivism theory, presents a promising avenue for enhancing Mathematics Logical Reasoning Ability among first-year students at Xi'an University. This endeavor aligns with the evolving landscape of educational reforms emphasizing diversified evaluation methods and the cultivation of core literacy skills, particularly logical reasoning. The theoretical foundations of Constructivism theory provide a framework for fostering active, student-centered learning experiences, enabling students to become leaders in their own learning

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

journeys. Through SPOC teaching, students engage in self- directed learning, cultivating lifelong learning skills while achieving course objectives more effectively. Research indicates that SPOC teaching yields several benefits, including increased student engagement, reduced performance disparities, and greater flexibility in teaching approaches. By leveraging SPOC in the teaching of elementary number theory, students can master fundamental concepts, understand practical applications, and enhance their mathematical logical reasoning abilities.(Du Xiaoyong & Lu Wei, 2017)

This research endeavor aims to address key questions surrounding the current state of college students' logical reasoning literacy, identify instructional strategies to cultivate this skill effectively, and assess the impact of SPOC- based teaching on students' Mathematics Logical Reasoning Ability. By embracing innovative teaching methods and leveraging technology, this research seeks to contribute to the ongoing advancement of educational practices and the promotion of student development in line with contemporary educational reforms.

**2.Research Objectives**

To investigate the impact of Small Private Online Course (SPOC) on Elementary Number Theory, grounded in Constructivism theory, on First Year students' Mathematical Logical Reasoning Ability and their satisfaction levels.

**3.Literature Review**

The literature review in this study is related to this study comprised of elementary number theory with Small Private Online Course (SPOC) based on Constructivism theory,Mathematics Logical Reasoning Ability,students' satisfaction research related to this study.

3.1 Small Private Online Course (SPOC) on Elementary number theory course content based on Constructivism theory teaching approach

Since the emergence of MOOC courses, the teaching methods of university courses dominated by traditional classroom teaching have been changed (He Bin, Cao Yang, 2015). However, the teaching effect of MOOC has been controversial due to shortcomings such as high dropout rate, low completion rate, incoherent teaching fragments, and lack of communication between learners and teachers (Kang Yeqin, 2014). Armando Fox and David Patterson proposed the SPOC teaching model based on MOOC, namely Small Private Online Course (SPOC), which effectively makes up for the limitations of MOOC Some shortcomings (Huang Hui and Xiong Qin, 2016) took the SPOC teaching model as a guide and proposed a teaching design model based on the SPOC teaching model to design the overall classroom teaching design, teaching content system design, teaching process design and teaching evaluation system. (Wang Na, Chen Juanwen, Zhang Dandan, 2016)

First, we explore the elements of an effective learning environment. Then we deconstruct traditional classrooms by integrating online courses, mobile learning, and social interaction, and reconstruct classroom teaching on this basis. We establish a SPOC flipped classroom, aiming to explore an effective learning model and provide courses with Provide resources, environment, time and space for effective learning to occur. (Shi Ling, 2016) Blended teaching based on SPOC subverts the traditional classroom teaching form in colleges and universities and makes up for the shortcomings and deficiencies of MOOC. Application advantages of SPOC. As one of the main methods of future course teaching, the SPOC teaching model can effectively promote students' independent learning and thinking inside and outside the classroom, placing more emphasis on students' complete and in-depth learning experience, and at the same time prompting teachers to have a more in- depth and thorough understanding of course teaching before teaching. Comprehensive and personalized curriculum understanding and teaching arrangements (Fu Yanfang, Yang Hao, 2017)

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

Constructivism emphasizes students' active exploration of knowledge and active construction of learned knowledge, which is consistent with SPOC' s emphasis on student-centered learning. In the course design based on the SPOC teaching model, teachers integrate The basic ideas of constructivism theory can better guide students' online learning activities. Class discussions are no longer limited to theoretical knowledge, but also include the application and practice of knowledge (Wei Yuanyuan, 2017). (Li Lin, Du Ziwei, 2019) In the article "A Brief Discussion on the Application of Elementary Number Theory in Middle School Mathematics Competitions", the divisibility of integers and the application of related theorems in various mathematics competitions are briefly discussed, especially integer division and rotation. Division method, fundamental theorem of arithmetic, Gaussian function, etc., they not only play an important role in primary and secondary school mathematics competitions, but also cultivate students' core competencies such as mathematical abstraction and logical reasoning, and enhance students' mathematical thinking; Gu Jie(2013) in "Reduction Thinking Methods in Elementary Number Theory" believes that elementary number theory contains rich reduction thinking methods, and proposes that in the teaching process, attention should be paid to the organizing process of reduction thinking. (Zhang Tinghai, 2016) In the article "Research on the Reform of Elementary Number Theory Teaching for Teachers and Students in Higher Education Institutions in my country", he discussed the importance of elementary number theory courses for students and gave three reform suggestions. (Li Xiuli, 2017) In the article "Several Issues That Should Be Attention in the Reform of Elementary Number Theory Teaching", it was proposed in terms of teaching methods that when teaching elementary number theory courses, special topics can be appropriately carried out to cultivate students' awareness of participation and ability to summarize. It can also be expanded by combining the history of mathematics to consciously cultivate students' good moral character.

3.2 The teaching process uses task design, complex environment design, autonomous problem solving, thinking stimulation, and social testing and reflection.Synthesize the teaching process of Small Private Online Course(SPOC) on Elementary number theory courses based on Constructivism theory to enhance the ability of logical reasoning 5 Step.

task design, complex environment design, autonomous problem solving, thinking stimulation, and social testing and reflection. Synthesize the teaching process of Small Private Online Course (SPOC) on Elementary number theory courses based on Constructivism theory to enhance the ability of logical reasoning 5 Step.

Step 1: **Task design** is to design practical tasks and integrate multiple content or skills. Specifically, it includes determining the goals and requirements of practical tasks, clarifying the knowledge and skills that students need to master, and designing specific content and steps for practical tasks. For example, a project can be designed that requires students to collaborate in a team to complete a complex task that involves knowledge and skills from multiple subject areas, such as mathematics logical reasoning ability.

Step 2: **Complex environment design** is to design a complex environment that reflects effective actions taken by students after learning. Specifically, it includes providing students with a realistic and challenging environment where they can apply their knowledge and skills to solve practical problems. For example, a virtual environment can be designed that requires students to play different roles, interact with other students, and solve various problems.

Step 3: **Autonomous problem solving** is to give students autonomy in problem-solving and inspire them to solve problems themselves. Specifically, it includes guiding students to think and explore independently, encouraging them to ask questions, find answers, and continuously try and improve in practice. For example, students can choose their own

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), , (), ...-...; DOI:

methods and approaches to solve problems and encourage them to try different methods and ideas.

Step 4: **Thinking stimulation** is to support and stimulate students' thinking in a learning environment. Specifically, it includes providing students with diversified learning resources and tools, encouraging them to carry out cooperative learning and exchanges, and stimulating their innovative thinking and exploration spirit. For example, various resources and tools can be provided, such as libraries, laboratories, computers, etc., to help students conduct research and exploration.

Step 5: **Social testing and reflection** is to encourage students to test their perspectives in a social context and support their reflection. Specifically, it includes guiding students to apply their knowledge and skills to social practice, allowing them to continuously reflect and summarize in practice, and improving their abilities and qualities. For example, students can participate in community activities or practical projects to test their perspectives and ideas, and encourage them to reflect on their own behavior and decisions.

**4.Research conceptual framework**

The variables included in this study were: The independent variable is Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory. The dependent variable are Mathematics Logical Reasoning Ability and Students' Satisfaction.(Qin Wei, 2023)

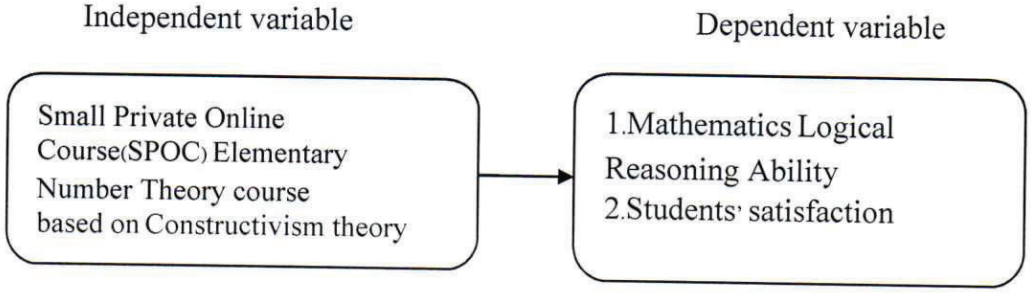



Figure1. Independent variable and dependent variable

**5.Research Methodology**

5.1 Population and sample

5.1.1 The population in this study was 80 students majoring in mathematics from first year students in Xi'an University.

5.1.2 The sample of this study was 40 students majoring in mathematics of first year students in Xi'an University, derived from 80 students by cluster simple random sampling method.

5.2 Research instruments

Research instruments were the tools for conducting the research to collect data. The research instruments which were used in this study were:

5.2.1 Instruments for measuring mathematics logical reasoning ability

1. Expert group composed of five experts evaluate the evaluation form. Five experts consisted of 2 specialists in curriculum field, 2 specialists in instruction relevant to specific content, and 1 specialist in measurement and evaluation field. The Index of Item Objective Congruence (IOC) of each item of the evaluation form was between 0.60-1.00, higher than 0.5. The result of analyzing the IOC index showed that the evaluation form about lesson plans of Elementary Number Theory course were appropriate and could be used in the evaluation Elementary Number Theory course.

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

2. Expert group composed of five experts used the evaluation form to evaluate the seven lesson plans of the elementary number theory course. The evaluation form of the lesson plan was established using the 5-point Likert scale method. According to the expert evaluation, the scores of the seven lesson plans are all above (M=4.40, SD=0.62). Therefore, the seven lesson plans of Elementary Number Theory course were applicable to the teaching of the year 1 students of mathematics major in Xi'an University to enhance their Mathematics Logical Reasoning Ability.

5.2.2 Instruments for collecting data

The researcher provided an evaluation form to 5 experts to check or evaluate the lesson plans. After collecting data, analyze the collected data to determine the appropriateness and consistency of the lesson plans. If the average score of appropriateness and consistency assessed by a group of experts is higher than 3.51, it means that the components of the lesson plans have good appropriateness quality and internal consistency. After obtaining the expert evaluation results, the developed teaching model was revised and improved according to the expert's suggestions.

The evaluation form is provided to 5 experts for content validity check and suggestions. The quality of the evaluation form is considered according to the Index of Item Objective Congruence (IOC) obtained from the achievement test evaluation form. If the Index of Item Objective Congruence (IOC) of each item is greater than 0.5, it can be used. and every item where 1.00 is greater than 0.5. The result of analyzing the IOC index showed that all test items were appropriate and could be used in the test. Finally, analyze each item of the test and find out that item difficulty (p) should range from 0.58-0.73 and item discriminability (r) should should range from 0.27-0.55 and more than 0.20. Reliability of the mathematics Logical Reasoning Ability test is 0.84 and more than 0.7 (Richardson, M. W., & Kuder, G. F.. 1939: 681-687).

As presented,in the 20 items of satisfaction questionnaire, the lowest mean score was (M=4.4,SD=0.55), and the highest mean score was (M=4.80,SD=0.55). The result of this Table 17 showed that the students' satisfaction of the elementary number theory course based on Constructivism theory was very high level ( M= 4. 58,SD=0.52).

The questionnaire is provided to 5 experts for content validity check and suggestions. The quality of the questionnaire is considered according to the Index of Item Objective Congruence (IOC) obtained from the achievement test evaluation form. If the Index of Item Objective Congruence (IOC) of each item is greater than 0.50(0.60-1.00), it can be used. The result of analyzing the IOC index showed that all test items were appropriate and could be used in the test. The Cronbach's Alpha coefficient of the reliability of the student satisfaction questionnaire is 0. 83, which is greater than 0. 70. Therefore, the reliability of the student satisfaction questionnaire meets the requirements (Cronbach, L. J., 1951)

**6.Data collection**

The procedures of data collection were as follows:

6.1 The sample was given the pre-test score of the Mathematics Logical Reasoning Ability test paper by using constructed instrument.

6. 2 The sample was taught by using the Small Private Online Course ( SPOC) on Elementary Number Theory course based on Constructivism theory.

6. 3 After the sample implemented Elementary Number Theory course based on Constructivism theory, the sample was given the post-test score by using the same instrument which was used in the pre-test.

6.4 Evaluation students' satisfaction using satisfaction questionnaire.

**7. Data analysis**



Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

In this study, data were analyzed by using the statistical method according to the research objectives.

7.1 Compare the scores of test paper before and after the teaching of Elementary Number Theory course based on Constructivism theory by using t-test for dependent sample.

7.2 Analyze the student satisfaction data using Cronbach's Alpha method (Lee J. Cronbach, 1951) and determine the level of student satisfaction.

**8. Research Results**

The results were presented according to the research objectives as follows:

8.1 Result of comparing Mathematics Logical Reasoning Ability of the students before and after receiving Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory by using t-test for dependent sample.

Table 1 Paired sample test about Mathematics Logical Reasoning Ability

| Group | N | Pretest scores | | Post-test scores | | t | p |
|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | | |
| Experimental group | 40 | 19.48 | 4.40 | 22.50 | 4.92 | 15.84* | 0.000 |

*$P < .05$

As presented in Table 1, the mean scores of pre-test of students' mathematics logical reasoning ability was (M=19.48,SD = 4.40) and the mean scores of post-test of students' mathematics logical reasoning ability was (M=22.50,SD = 4.92). The result of this Table 1 showed that after implementing the he Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory in the classroom, the post-test scores of students' mathematics logical reasoning ability was greater than pre-test scores at .05 level of statistical significance( t= 15. 84, p<. 05). The average scores of the study developed increasingly higher than pre-test.

8.2 Data analysis result of students' satisfaction questionnaire

The researcher used the satisfaction questionnaire to conduct a survey on the year 1 mathematics students of Xi'an University, and randomly selected 40 students' data for analysis (The same students to pre-test and post-test).

Table 2 Mean score and satisfaction level of Students' satisfaction about Small Private Online Course (SPOC) on Elementary Number Theory course course

| ***Question number of satisfaction questionnaire*** | | ***M*** | ***SD*** | ***Satisfaction level*** |
|---|---|---|---|---|
| ***Section*** | ***Question number*** | | | |
| Part 1: Teaching objectives | 1.Satisfaction with whether the teaching objectives of the Elementary Number Theory Small Private Online Course (SPOC) are clear and accurate: | 4.40 | 0.55 | High |
| | 2.Satisfaction with the clarity of teaching objectives of the elementary number theory course Small Private Online Course (SPOC): | 4.60 | 0.55 | Very high |



Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), , (), ...-...; DOI:

| *Question number of satisfaction questionnaire* | | *M* | *SD* | *Satisfaction level* |
|---|---|---|---|---|
| *Section* | *Question number* | | | |
| | 3.Satisfaction of the teaching objectives of the Elementary Number Theory Small Private Online Course (SPOC) meet the requirements of enhancing logical reasoning ability: | 4.80 | 0.45 | Very high |
| Part 2: Teaching content | 4.The Satisfaction of whether the teaching content of the elementary number theory course Small Private Online Course (SPOC) is easy to understand: | 4.60 | 0.55 | Very high |
| | 5.Satisfaction with whether the teaching content of the Elementary Number Theory Small Private Online Course (SPOC) is new and can stimulate learning interest: | 4.40 | 0.55 | High |
| | 6.Satisfaction of whether the teaching content of the Elementary Number Theory Small Private Online Course (SPOC) has practical significance: | 4.40 | 0.55 | High |
| | 7.Satisfaction with whether the teaching content of the Small Private Online Course (SPOC) in the elementary number theory course can enhance students' logical reasoning ability: | 4.60 | 0.55 | Very high |
| | 8.Satisfaction with whether teachers of the elementary number theory course Small Private Online Course (SPOC) explain the teaching content clearly : | 4.40 | 0.55 | High |
| Part 3: | 9.Satisfaction level of effective communication between teachers and students in the Elementary | 4.60 | 0.55 | Very high |



Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

| *Question number of satisfaction questionnaire* | | *M* | *SD* | *Satisfaction level* |
|---|---|---|---|---|
| *Section* | *Question number* | | | |
| Instructional strategy | Number Theory Course Small Private Online Course (SPOC): | | | |
| | 10.Satisfaction with the teaching process design steps of the elementary number theory course Small Private Online Course (SPOC): | 4.80 | 0.45 | Very high |
| | 11.Satisfaction with the teaching method (constructivism theory) of the small private online course (SPOC) in the elementary number theory course to improve the classroom atmosphere: | 4.40 | 0.55 | High |
| | 12.Satisfaction with class hour allocation of small private online courses (SPOC) for elementary number theory courses: | 4.60 | 0.55 | Very high |
| | 13.Satisfaction with the teaching approach of the Elementary Number Theory Small Private Online Course (SPOC) to enhance students' logical reasoning ability: | 4.60 | 0.55 | Very high |
| Part 4: Teaching resources | 14.Satisfaction with the combination of teaching resources and media of practical problems: | 4.40 | 0.55 | High |
| | 15.Satisfaction with teaching resources and media to enhance logical reasoning ability: | 4.80 | 0.45 | Very high |
| | 16.Every student satisfies with teaching resources and media used in the the introductory number theory course Small Private Online Course (SPOC): | 4.80 | 0.45 | Very high |
| Part 5: | 17.Satisfaction with the difficulty of assignment of the Elementary | 4.60 | 0.55 | Very high |



Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

| *Question number of satisfaction questionnaire* | | *M* | *SD* | *Satisfaction level* |
|---|---|---|---|---|
| *Section* | *Question number* | | | |
| Teaching evaluation | Number Theory Course Small Private Online Course (SPOC): | | | |
| | 18.Satisfaction with the number of assignments for the Elementary Number Theory Small Private Online Course (SPOC): | 4.60 | 0.55 | Very high |
| | 19.Satisfaction with the effectiveness of the evaluation system(include test paper and course thesis): | 4.80 | 0.45 | Very high |
| | 20.Evaluation system(include test paper and course thesis) can differentiate student logical reasoning ability in learning the small private online course (SPOC) of the elementary number theory course: | 4.40 | 0.55 | High |
| | ***Total/Over all*** | 4.58 | 0.52 | Very high |

As presented in Table 2, in the 20 items of satisfaction questionnaire, the lowest mean score was (M=4.40,SD=0.55), and the highest mean score was (M=4.80,SD=0.55). The result of this Table 2 showed that the students' satisfaction of the Small Private Online Course (SPOC) on elementary number theory course based on Constructivism theory was very high level ( M= 4.58,SD=0.52).

**9.Discussion**

9.1 The researcher conducted a detailed literature analysis in the early stage, discussed the research background of this study from the current status of traditional teaching, the development of online learning, the emergence of blended learning, and the rise of SPOC, and briefly introduced the research of this study. background. This paper analyzes the current status and research trends of domestic and foreign blended learning, SPOC, SPOC-based blended learning process and mathematics students' logical thinking ability. And respectively elaborated on its definition, connotation, characteristics, theoretical basis and teaching practice, laying the foundation for the development of Xi'an University's elementary number theory course small-scale private online course (SPOC) based on constructivism theory to improve the development of first-year students' mathematical logical reasoning ability. theoretical basis.

In the context of "Internet education", the comprehensive application of SPOC technology in teaching, the in-depth development of the integration of information technology and curriculum, etc., first of all, is the ability of teachers to use information technology. Teachers' information technology application capabilities have undoubtedly become an important soft power in promoting the reform of basic education curriculum and promoting the professional development of teachers. Focus on "teachers' information technology application ability in the

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

teaching preparation stage" , " teachers' information technology application ability in the implementation stage of teaching activities", and "teachers' information technology application ability in the teaching process" . "Teaching Implementation, Technology Usage Frequency" , " Teacher Information Technology Usage Frequency in the Reflection Stage of Teaching Evaluation" , " Teacher Technology Application to Promote the Development of Students' Information Learning Ability", and "Information Technology Application Ability" surveys run through college teachers The proficiency and frequency of technology application include pre-class preparation, in-class implementation, post-class evaluation and reflection, promotion of technology application, etc. Which is consistent with the research of Zhang Yi( 2015) . In addition, Xi'an University is located in a western province and city, and there is a certain gap between its economic strength and that of the central and eastern parts of the country. Instead, it should catch up.

9.2 The current curriculum development and its own foundation are weak, as well as insufficient pre-training for information-based teaching. Constructivism theory provides some useful perspectives and strategies to help overcome these challenges and should improve students' learning effects and meet individualized needs.

Constructivism and information-based teaching pre-training. Constructivism theory encourages learners to use modern technology and online resources to construct knowledge. However, students may need training in information-based teaching to make better use of these resources. Schools can help students master digital skills, understand how to effectively search and filter online information, and how to participate in online learning communities by providing targeted pre-information teaching training. These trainings can meet students' information needs and help them better adapt to the modern education environment. In terms of individual needs, personalized learning is encouraged. Each student has different learning paths and needs. Schools can use different teaching methods to meet the diverse needs of students. This includes providing resources and guidance for independent learning, supporting group work and project learning, and tailoring courses to students' interests and learning styles. In this way, students can better achieve personalized learning goals, overcome their own weaknesses, and realize their potential.At the same time, Zhang Xiumei and three others (2023) also have the same view, attaching importance to the intelligence of the smart environment, and the teaching programs in the teaching model are more accurate and personalized. The intelligence and ecology of the smart environment allow teaching to be borderless, and students can learn according to their needs. You can be immersed in learning at any time, and the connection and coupling of various teaching elements are more ecological and integrated. For such a fast feedback system, accuracy is inevitable. Educational big data mining technology has penetrated into fields such as student learning tracking and performance prediction, auxiliary teaching, examination applications, student behavior and psychological identification, and has produced many educational application products. The ultimate goal of data mining is to scientifically determine teaching problems and accurately implement intervention, so that the teaching process and teaching procedures are dynamic and generative, and the resulting learning path is more accurate and personalized. Through this, teachers can "determine teaching based on learning" and "teach students in accordance with their aptitude" on a large scale. "Students' demands for 'personalized learning' can be met under big data conditions."

9.3 Based on constructivism, it is of great help to the development of elementary number theory courses and SPOC to improve the logical thinking ability of mathematics students, and student satisfaction has been greatly improved after students adopted this approach. The first is that timely feedback and assessment are key to ensuring students understand their academic

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

progress and provide opportunities to improve. This includes educators providing feedback, students receiving grades and comments as soon as possible after submitting assignments, and students being able to self-assess their own learning progress. Make sure students actively participate in self-assessment and not just be assessed by the teacher. Students may need to develop skills in self-reflection and self-evaluation. Cai Minjun (2021) also proposed to further optimize the design of online learner evaluation activities: (1) Evaluation results should be selectively applied according to different student ability levels; (2) Teachers should give more help to students in the early stages of participating in evaluation; (3) It is necessary to continue to pay attention to the development of students' evaluation abilities.

The second is continued improvement involving educators and schools regularly reviewing and updating curriculum and teaching methods to reflect student needs and the latest educational trends. This can include updating teaching materials, improving course design, and adopting new teaching technologies. In practice, educational institutions may be affected by budget constraints, time constraints, and policy constraints that may prevent timely improvements in curriculum and teaching methods. Additionally, educators may need training to adapt to new teaching methods and technologies, which may require additional resources and time.Xu Jinghai (2022) mentioned a similar view on teaching resources, achieving online and offline integration and complementarity, and being diverse and rich. In addition to course websites and teaching materials as the core, it also includes cloud resources, virtual simulation projects, reference quality courses, and course design tasks. books, computer experiment task books, etc.

The third is student well-being including physical health, mental health and social support. Schools and educators should provide resources and services to help students maintain healthy lifestyles, provide mental health supports, and promote social interaction and support. Student mental health issues may become more prevalent in educational settings, but providing adequate mental health support is a complex task. Yu Guoliang (2023) elaborated on the "efficiency-enhancing" value of digital technology in the prevention and teaching, counseling and intervention, monitoring and evaluation, and practice of school mental health services; it was clearly proposed that digital technology should be used to lead school mental health in the new era. An important tool and practical path to serve high-quality and high-level development.Schools may need to increase resources for mental health services to meet student needs. Additionally, social support may also be affected by the way students interact socially, particularly in digital learning environments. The implementation of these methods can effectively improve student satisfaction.

**10.Conclusion**

Through the comparative analysis of the results of the pretest and post-test of the First grade students using the teaching method of SPOC blended teaching that combines online and offline, after the intervention of SPOC combined with Constructivism theory. The conclusion was as follows:

10.1 The mathematics logical reasoning ability data analysis about pre-test and post-test showed the mean score of post-test data was 3.07 higher than that of pre-test data. When the confidence level was .05, and the t-test value Sig. = 0.000 <.05 (The mean of pre-test was 19.48, the mean of post-test was 22.55).

10.2 The students' satisfaction was very high level. The lowest mean score was 4.40 and the highest was 4.80, higher than 3.51.The mean scores of students' satisfactions with Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory were high level (M = 4.58, SD = 0.52).

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

In this study, SPSS software was used to evaluate the student's satisfaction with the teaching of Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory. The results show that students have higher satisfaction with Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory. In the classroom practice of Small Private Online Course (SPOC) on Elementary Number Theory course based on Constructivism theory, Cultivate students' ability and character such as problem solving, cooperation and communication each other. Students will be involved in learning faster, helping to enhance mathematics Logical Reasoning Ability, and can win the popularity of students.

## 11.Recommendation

### 11.1 Recommendation for implication

Due to the complexity of the learning system and the limitation of research time, the research in this article is still imperfect and needs further in-depth research and exploration in the following aspects:

1. Refining Indicators: The determination of indicators for college students' mathematical logical reasoning ability requires refinement and modification, followed by expert discussion for establishing comprehensive indicators. Future research should aim to improve and localize these indicators to better guide teaching practices.

2. Integrating Educational Technology: Incorporating educational technology into mathematics classrooms is essential. Developing students' familiarity with teaching equipment and digital resources will optimize the teaching-learning process and promote educational reform. This includes subject-specific information technologies to enhance students' mathematical logical thinking abilities.

3. Enhancing Representativeness: To ensure the generalizability of results, future research should include a more comprehensive and diverse sample of institutions. The current study's focus on one university limits its representativeness. Collaboration among researchers, teachers, and students from various institutions is necessary to address regional disparities and advance theoretical frameworks for teaching elementary number theory and SPOC courses.

### 11.2 Recommendation for further research

1. Embrace Reflective Teaching in Mathematics: Reflective teaching in mathematics involves both teaching mathematics and teaching how to teach mathematics, fostering a reciprocal learning process. Teachers and students engage in "dual learning," where reflecting on teaching guides students' reflective learning, leading to effective teaching practices and continuous self-improvement in mathematical understanding and teaching skills.

2. Explore Diverse Teaching Methods: Mathematics teaching should evolve beyond traditional methods to cultivate students' logical thinking abilities and enhance teachers' pedagogical skills. While traditional methods are valuable, diversifying teaching approaches based on content and student needs enriches the teaching of mathematical logical reasoning.

3. Adapt Elementary Number Theory Teaching: As mathematical logical reasoning is crucial for problem-solving, elementary number theory classroom teaching must evolve to meet contemporary needs. By aligning teaching materials with core mathematical competencies, teachers can seamlessly integrate mathematical logical reasoning development into the curriculum, without overemphasizing specific competencies. Additionally, advancements in computer and big data technologies hold promise for further enhancing students' mathematical logical thinking abilities through elementary number theory courses.

In conclusion, addressing these aspects in future teaching practices will help researchers refine current methodologies and foster the development of students' mathematical logical thinking abilities, leveraging technological advancements and educational trends.

Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI:

## 12.References


Cai Minjun, Wang Xinyi, Guo Wanrong, Li Yan and Li Mang. (2021). Theoretical discussion and empirical research on online learner participation evaluation. China Audio-visual Education (03).

Du Xiaoyong, Lu Wei. (2017). "SPOC Report: Our Practices and Insights." Computer Education, 11, 5-9. doi:10.16512/j.cnki.jsjjy.2017.11.003.

Fu Yanfang, Yang Hao. (2017). Design and practice of hybrid teaching model based on SPOC. Vocational and technical education (26).

Gu Jie. (2013). Reduction thinking method in elementary number theory. Journal of Jiamusi Education College (12).

He Bin Cao Yang. (2015). SPOC: Teaching process innovation based on MOOC. China Audio-visual Education (03).

Huang Hui and Xiong Qin. (2016). Research on the SPOC foreign language teaching model based on the "post-method" theoretical perspective. Foreign language audio-visual teaching (04).

Kang Yeqin. (2014). The "Post-MOOC Era" of Online Education - SPOC Analysis. Tsinghua University Education Research (01).

Li Lin and Du Ziwei. (2019). A brief discussion on the application of elementary number theory in middle school mathematics competitions. Modern Economic Information (02).

Li Xiuli. (2017). Several issues that should be paid attention to in the teaching reform of elementary number theory. Science Journal of Normal University (03).

Shi Ling. (2016). Application of SPOC model in college teaching - taking engineering graphics courses as an example. Heilongjiang Higher Education Research (11).

Wang Na, Chen Juanwen and Zhang Dandan. (2016). College English SPOC flipped classroom: the construction of an effective learning model. Foreign Language Audio-visual Teaching (03).

Wei Yuanyuan. (2017). "Introduction to the Basic Principles of Marxism" SPOC Course Study from the Perspective of New Constructivism. Research on Ideological and Political Courses (02).

Xu Jinghai, Dong Youfu, Zhang Yunpeng and Lu Huaxing. (2022). Exploration and practice of teaching reform of online and offline mixed geographical information system principles course. Surveying and Mapping Bulletin (S1).

Yu Guoliang and Zhang Zhe. (2023). Digital technology empowers school mental health services. Tsinghua University Education Research (01).

Zhang Tinghai. (2016). Research on the teaching reform of elementary number theory for teachers and students in higher education institutions in my country. Journal of Nanchang Normal University (06).

Zhang Xiumei, Zhao Mingren and Lu Chunping. (2023). Research on the creation path of primary and secondary school teaching models empowered by technology - policies, theories, achievements, characteristics and trends. China Audio-visual Education (08).

Zhang Yi, Ma Jingsi, Zhou Pinghong, Fan Fulan & Bai Qingyu. (2015). Current status of primary and secondary school teachers' information technology application capabilities and training suggestions. China Audio-visual Education (01).



Citation: Qin, Wei, Juithong, S., & Jirojphan, W., (2023). The Effect of teaching a Small Private Online Course(SPOC) on Elementary Number Theory course based on Constructivism theory to enhance mathematics Logical Reasoning Ability for First Year Students of Xi'an University. International Journal of Sociologies and Anthropologies Science Reviews (IJSASR), . (), ...-...; DOI: