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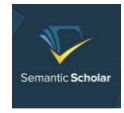


TABLE OF CONTENTS

SIEF, Vol. 9, No. 2, August 2021

EDITORIAL

Education Should Return to Its Essence

Annalisa Morganti,[1] Marta Pellegrini[2]

1. *Department of Philosophy and Social, Human and Educational Sciences, University of Perugia, Italy*
2. *Department of Education, Languages, Intercultures, Literatures and Psychology, University of Florence, Italy*

> *"Education is what remains after one has forgotten what one has learned in school."*
>
> *–Albert Einstein*

THE essence of education is an old topic. It is not only a theoretical problem, but also a practical problem. The essence of education is directly related to the answer to "What is education?", and how to answer "What is education?" directly determines the way and content of education. On this basis, the statements about the nature of education also guide and standardize people's educational concepts and behaviors (Shi, 2018). It can be said that human beings have been thinking about this issue since they have had educational practices. After the independence of the educational discipline, the discussion about the essence of education has become a basic problem of pedagogy. Scholars try to find answers to other specific educational questions by solving "What is education?"

As the first educational thinker of modern world education, Comenius was the first to answer questions about the essence of education. He believed that education is "the universal art of teaching everything to all people" (Comenius, 1896).

In the 17th century, the British educator Locke put forward the "whiteboard theory", advocating that the human mind is a blank paper, "the human mind has no talent principle". Through education, learners can master knowledge and virtues (Locke, 1970).

In the 18th century, French educator Rousseau proposed "Nature Education". He pointed out that the task of education is to free children from the shackles of society and return to nature" and cultivate natural persons (Rousseau, 2010).

In the 19th century, German educator Herbart defined pedagogy as a science based on practical philosophy and psychology in his masterpiece "General Pedagogy". He believed that the purpose of education is "virtue," and the way of education is "teaching" (Herbart, 1806).

Ushinsky, known as the "founder of Russian educational science", discussed education in both broad and narrow sense. He believes that education in a broad sense is unconscious education. Nature, family, society, people and their religion and language are all educators. In the narrow sense of education, the school is the educator who bears the actual responsibility and the teacher is the educator. A sound education can make the physical, intellectual and moral powers of human beings widely used (Ushinsky, 2002).

In the 20th century, Dewey started from the philosophy of pragmatism and advocated "education is growth" and believed that "education is the transformation or reorganization of experience. This transformation or reorganization can not only increase the meaning of experience, but also improve the ability to guide the subsequent process of experience" (Dewey, 1903).

As a result, educators in different periods have put forward different views on education according to their own philosophical views, but the core is that education is an activity to cultivate people, and the focus of education should always be around students (Yang, 2021). From this perspective, we can answer the essential question of education, which can be summarized as that education is an activity that improves the quality of individual life and the value of life.

It is also based on this view of the essence of education that people often need to determine the content and methods of education according to the development needs of students when carrying out educational activities. For example: Inclusive education aimed at helping children with and without certified disabilities embracing all human diversities; Innovative education aimed at cultivating students' innovative ability; and information technology education to better promote the development of students.

The articles published in this issue of *SIEF* explain the answer to the essence of education from a different perspective. Marsili et al. (2021) "The Italian leadership on inclusive education: myth or reality? The Italian leadership on inclusive education: myth or reality?" answered from the perspective of inclusive education that education should accommodate all students. There is no exclusion, no discrimination, and no classification of all personnel activities. Meng (2021) "How to Use Activities to Realize the Self-Management of Middle School Students?" emphasized that education should be based on the development needs of students, create activities for students' self-development, and realize students' self-management. Zhang (2021) "The Construction of Innovative Education Curriculum System for High School Students: Based on the Practice of 'Workshop + Project' Innovative Educa-

tion Curriculum of Zhengzhou No. 12 Middle School, China" called for the cultivation of students' practical ability and innovative consciousness in education and teaching. Gu et al. (2021) "Does Abracadabra Help Improve the English Reading Ability of Chinese Elementary School Students? A Quasi-Natural Experimental Study" presented a specific education method, that is, the use of electronic software to improve students' learning ability. While answering the original question, education also needs to be integrated with the times and society, Wang (2021) "A Review of the Development of the Integration Strategy of Information Technology and Education in the Four Countries of the United States, Britain, China, and Singapore" endowed education with distinctive characteristics of the times. It paid attention to the education informatization policies in different countries and different eras, linked education and informatization policies, and highlighted the social and contemporary characteristics of education.

What is education? Various definitions have the background of the times and the author's judgment. How to correctly understand these definitions requires clarification and analysis. *SIEF* hopes to use this series of articles to explain the essence of education in a more comprehensive way, and to help everyone better understand and interpret the basic question of what education is.

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Correspondence to:
Annalisa Morganti
Associate professor in Special Education
University of Perugia
06123 Perugia (PG)
Italy
E-mail: annalisa.morganti@unipg.it
AND
Marta Pellegrini
Fixed-Term Researcher
Department of Education, Languages, Intercultures, Literatures and Psychology
University of Florence
50121 Florence (FI)
Italy
E-mail: marta.pellegrini@unifi.it

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COMMENTARY

How to Improve the Actual Effect of Computer-Assisted Teaching?

Xiaoqiao Cheng

School of Institute of Education Science, Nanjing Normal University, Nanjing 210097, Jiangsu, China

> *"The computer was born to solve problems that did not exist before."*
>
> *–Bill Gates*

CLARK & STARR (1986) found in a study that the amount of memory of students varies depending on the situation: 10% of people can remember the information or knowledge "read"; 20% can remember the "heard" Information; 30% of people can remember what they "see"; 50% of people can remember what they "hear and see"; 70% of people can remember information "said"; 90% can Remember the "said and done" things. Therefore, if the learner only uses reading or listening or seeing methods when studying, the amount of memory of information is limited, but if the learner can do it by hand, it can deepen the impression and increase the memory capacity of information. Although traditional textbooks can assist learners to record external information in words, they still have certain limitations on abstract mathematical knowledge or scientific learning, and the rapid development of computers can make up for this deficiency. Computers can present dynamic images and provide learners with a powerful learning and perceptual experience, enabling learners to be more perceptive to abstract concepts (Fan, 2014).

Therefore, since IBM designed the first computer-assisted teaching system based on the IBM650 computer in 1958, computers have become an important form of auxiliary teaching (da Cruz, 2021). During this period, due to the large computer mainframe, it was not until the advent of microcomputers

in the late 1970s to the late 1980s that the Computer Assisted Instruction (CAI) project was applied in schools, and then interactive multimedia entered schools. With the influence of long-distance communication and the Internet, the model and method of CAI have undergone major changes: using computers to help or replace teachers to discuss teaching content with students in a dialogue mode, arrange teaching progress, transmit teaching information, and conduct teaching training, which makes computers supplementary teaching has received wider attention.

In terms of purpose, this kind of attention is more about the effect of CAI. Since then, whenever a new media or software appeared, the first question that education researchers asked was: Can this media or software be used for teaching? Can learning be done through this media/software? Compared with the original teaching media or similar teaching software, can this new media/new software be more effective in improving learning efficiency and teaching quality and optimizing teaching goals?

In the process of research on teaching effects, two opinions have gradually formed. One group believes that computer-assisted teaching can improve student performance more than traditional methods, and is especially beneficial to poor students and elementary school students (Kulik & Kulik, 1991; Cheung & Slavin, 2012). The other faction believes that the effect of computers on performance is only a "carrier", and it has no effect on the improvement of student performance, and even has a negative effect on student development (Clark, 1989; Fang & Huang, 2019). Even with the development of multimedia software so far, more forms of auxiliary teaching have emerged, such as electronic schoolbags (Li, 2019), education big data (Li & Xia, 2020), etc. But on the whole, the two parties have failed to reach a consensus.

In this issue of the magazine, Gu et al. (2021) discussed whether Abracadabra (ABRA), electronic software that focuses on natural spelling and aims to improve English reading ability, can improve the English reading ability of Chinese elementary school students. They explored the effect of using ABRA software on students of different grades by way of experimental research. The research results show that ABRA software can improve the abilities of students of all grades to varying degrees. From the perspective of language acquisition, this proved that the use of electronic software for teaching plays a positive role in students' academic performance. At the same time, the authors also noticed that under the same teaching conditions, the use of ABRA reading software for teaching in the second and third grades was not as effective as in the first grade. It is believed that the factors affecting this result were students' learning level and teachers' attitudes and methods towards e-learning software (Gu et al., 2021).

Based on this article, we can draw a conclusion: Internet teaching using electronic teaching software or other multimedia can play a certain role in promoting academic performance, just like traditional teaching. Therefore, the problem is not that schools do not use computers or the Internet, but how

to best use them, and should explore what methods are most effective for what kind of students under what conditions.

As Schramm said that any media, within its own limits, could complete any educational task, whether a student could learn more from one media than from another, and it seemed that it depends not only on what media was used, but also on how the media was used (Simonson & Thompson, 1997).

The study by Gu et al. (2021) gave us some enlightenment. For the same e-learning software, the implementation effect will be different due to the school's software/hardware conditions; teacher's teaching style, teacher's mastery and understanding, and students' learning characteristics. Then, when conducting computer or Internet-assisted teaching, we should comprehensively consider the influence of students, teachers, application environment and other factors. Pay attention to every link from software design to its application and the important role played by teachers. The characteristics of individual development of students cannot be ignored, and their abilities to solve problems and learn how to learn should be cultivated.

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***Correspondence to**:*
Xiaoqiao Cheng, Ph.D.
School of Institute of Education Science
Nanjing Normal University
Nanjing 210097
Jiangsu
China
E-mail: xqcheng2008@vip.163.com

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ORIGINAL ARTICLE

Does ABRACADABRA Help Improve the English Reading Ability of Chinese Elementary School Students? A Quasi-Natural Experimental Study

Hui Gu,[1] Jijun Yao,[1] Ping Bai,[2] Longjun Zhou,[3]
Alan C.K. Cheung,[4] Philip C. Abrami[5]

1. *Nanjing Normal University, Nanjing 210024, Jiangsu, China*
2. *Huajie Education Group, Lianyungang 222100, Jiangsu, China*
3. *Jiangsu Second Normal University, Nanjing 210013, Jiangsu, China*
4. *The Chinese University of Hong Kong, Hong Kong 999077, China*
5. *Concordia University, Montreal, Québec, H3H 2S2, Canada*

***Abstract**: ABRACADABRA (abbreviated as ABRA) is a software developed by Concordia University in Canada that focuses on natural spelling and aims to improve English reading ability. This research is based on 129 first graders, 213 second graders, and 275 third graders in the elementary school of Lianyungang Ganyu Huajie Bilingual School. We carried out a one-semester pre-and post-test and quasi-natural experimental research design to explore the effect of ABRA on students of different grades. The study results showed that ABRA improved students' abilities in all grades to varying degrees, but the impact of the first graders got the most significant. The results of classroom observations and interviews with teachers showed that teachers needed to apply systematic teaching strategies and the control of class attention play a key role in it. To improve students' English ability, teachers need to effectively improve their ability to apply information technology, especially in English class. Particularly in low-grade classrooms, attention should be paid to the management of class discipline to maintain its efficiency.*

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***Keywords**: English Learning, E-Learning Software (ABRA), English Teaching, Elementary School, Experimental Research*

***About the Authors:** Hui Gu, School of Educational Science, Nanjing Normal University, Nanjing 210024, Jiangsu, China. E-mail: gu_nnu@163.com*

Ping Bai, Huajie Education Group, Lianyungang 222100, Jiangsu, China. E-mail: 2691285308@qq.com

Longjun Zhou, School of Educational Science, Jiangsu Second Normal University, Nanjing 210013, Jiangsu, China. E-mail: 294437034@qq.com

Alan C.K. Cheung, Department of Educational Administration and Policy, The Chinese University of Hong Kong, Hong Kong 999077, China. E-mail: alancheung@cuhk.edu.hk

Philip C. Abrami, Centre for the Study of Learning and Performance, Concordia University, Montreal, Québec, H3H 2S2, Canada. E-mail: philipc.abrami@concordia.ca

***Correspondence to:** Jijun Yao, School of Educational Science, Nanjing Normal University, Nanjing 210024, Jiangsu, China. E-mail: yaojijun_njnu@163.com*

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Introduction

REGARDING the formation and development of children's second language, there have been studies from the perspectives of linguistics and sociolinguistics explaining the related factors and stages. The mother tongue transfer theory believed that mastery of the mother tongue would affect the second language learners' writing discourse organization, writing process and order, and language cognitive ability through the mother tongue's cultural thinking, knowledge, or ability (Wang & Wen, 2004). However, the effect varies with the degree of grammatical similarity between the mother tongue and the second language, especially the differences in pronunciation, vocabulary, and grammar. Chinese has a negative transfer effect on English learners (Su, 2000). Investigation and research have also found that the native language ability of Chinese college students plays a restrictive role in the transfer of English writing ability (Wang & Wen, 2004). In response to this, researchers start from the level of cognitive psychology and propose the steps of attention, memory, thinking, information processing, mother tongue transfer, and interlanguage formation in the process of language learning, taking the processing of interlanguage in the process of language development as the key (Wu, 2000).

Paivio's dual coding theory believes that a single sensation can only store a limited amount of information. The combination of visual and auditory stimuli can be an essential means for children to retain information (Mak et al., 2017). E-learning software fits the feature precisely. In recent years, the impact of educational information technology on the learning process and results and behavior of teachers and students, has received increasing attention. Many studies have affirmed the role of e-learning software in optimizing the educational process, increasing student engagement in learning, and enhancing teachers' teaching capabilities (Chen & Zhao, 2017; Gu et al., 2016; Li, 2016). It is its advantage that e-learning software can actively stimulate attention and memory with dynamic images and sound interaction (Fan, 2014). Primarily based on games' natural integration and mobile characteristics, e-learning software can significantly improve students' learning interest and engagement, which is particularly effective in English learning. Integrating the effects of e-learning software on students, Chueng & Slavin's meta-analysis results also found that information technology has positive impact on students ($d = 0.16$), implying the great potential of e-learning software in students' language learning (Cheung & Slavin, 2012).

Many studies with electronic teaching software were carried out in class to find out the effect on students' abilities. Among them, ABRACADABRA (abbreviated as "ABRA") software has achieved remarkable results. Its full name is "A Balanced Reading Approach for Children Always Designed to Achieve Best Results for All." Wood evaluated 20 types of English learning software in terms of shape, letter knowledge, phoneme awareness, word-sound relationship, decoding ability, reading fluency, text comprehension, etc., and believes that ABRA has a better overall performance (Wood et al., 2017). So far, ABRA software has carried out fruitful experiments in Canada, Australia, Hong Kong, China, Hunan and Nanjing[1], and other regions and countries

(Comaskey et al., 2009; Deault et al., 2009; Di Stasio et al., 2012; Wolgemuth et al., 2014; Mak et al., 2017; Wang & Wen, 2004). Abrami integrated experiments from different countries and territories. It did not conduct a country-based subgroup analysis of the included literature based on its unity of experiment organization and implementation and the consistency of comprehensive sample results. However, the results in the ability variables show that there are potential factors that affect the differences in each experiment (Abrami et al., 2015). At the same time, existing studies have found significant heterogeneity in the experimental results of electronic information technology in different countries and regions (Cheung & Slavin, 2012). This research was based on the cooperation of Nanjing Normal University, Jiangsu Second Normal University, the Chinese University of Hong Kong, and Concordia University in Canada. A survey was conducted on the Lianyungang Huajie Bilingual School, a private school with relatively abundant development space in China's more developed provinces. During the implementation, ABRA members of Concordia University in Canada introduced the design concept of ABRA software and the experience of implementation and teacher training in Canada, Australia and Kenya. Members of the Chinese University of Hong Kong introduced the implementation of ABRA software in Hong Kong and the focus of experimental research. Nanjing Normal University and Jiangsu Second Normal University mainly integrated the experiences of all parties to investigate the school and design experimental programs. This study aimed to explore another feasible path for the application of ABRA software in the local Chinese context.

Literature Review and Questioning

ABRA software is web software developed by Centre for the Study of Learning and Performance (CSLP) of Concordia University in Canada to improve student's English reading ability. It won the United Nations Best Learning Software Award in 2016. ABRA software is based on the six core skills of English reading ability proposed by the National Reading Panel (NRP): (1) Phoneme recognition skills: students can associate and correspond to the pronunciation of English letters and words; (2) Phoneme awareness: the ability of students to distinguish and colloquially extract single syllables from words; (3) Fluency: students can read English text quickly and expressively; (4) Reading comprehension: understanding and retelling text content; (5) Listening comprehension: understanding and retelling spoken language content; and (6) Vocabulary knowledge: recognize and understand the meaning of spoken words and text words. According to the activity needs of teachers, students, and parents, it sets up three main modules to guide the direction of activities of different groups (Abrami et al., 2015). Student module activities are the main content, including 17 "learning in doing" games. It takes natural phonics as the core, sets up games of different difficulty levels, and other activities related to reading fluency, reading comprehension, and writing: the parent module and teacher module difficulty levels. Among them, the content of the parent module mainly includes reading suggestions and reading materials for students at home; the content of the teacher module primarily consists of the teacher's teaching materials

and teaching guidance. Through the allocation of roles and tasks and the control of game content, ABRA can help students choose their learning progress according to their own situation and get timely feedback. Teachers can keep abreast of the situation of students at any time, and parents can participate in the overall development of student progress.

The experimental research of ABRA software first focused on the countries where English is the native language. The subjects of the experiment were young children who are just beginning to learn the English language. One of the experimental studies with the largest sample size is Savage et al., based on 1,067 preschool and elementary school first- and second-year students in 74 classes in Alberta, Ontario, and Quebec. The study results found that students in the experimental group generally performed better after one semester of use than schools in the control group. It is particularly prominent in item phoneme combination ($p < 0.01$), syllable-letter matching ($p < 0.01$), and fluency of phoneme decomposition ($p < 0.01$) (Savage et al., 2013). Studies have also compared the characteristics of students and found that boys in the experimental group are significantly higher in sentence comprehension, paragraph comprehension, and total scores than boys in the control group. At the same time, girls do not show this difference (Abrami et al., 2016).

In some areas with official second language, researchers made some attempts to help students with different language capabilities improve English language through ABRA software. Wolgemuth et al. found that after a minimum of 120 minutes of intervention per week, the English reading development of indigenous students gradually kept pace with the non-indigenous peoples. In addition, indigenous students who have also used ABRA software are more advanced in terms of word reading and phoneme awareness. Researchers believe that this is due to the ceiling effect of the students of indigenous peoples in phoneme learning, which fully demonstrates that ABRA software can help students with weaker English foundation in the English language environment (Wolgemuth, 2019). ABRA software has also conducted some research in non-English speaking countries. The researcher took students with lower social and economic backgrounds in Kenya as the research objects. They found that after 13 weeks of using ABRA software. Students were improved in vocabulary and phonetics, as well as English, mathematics, science, and social subjects (Abrami, 2016). The Hong Kong experiment is similar to the previous experiments in English-speaking, second-language parallel, and non-English-speaking regions, indicating the beneficial effects of ABRA software. However, the research of Mak et al. discussed the variables of teacher attitudes and teacher teaching behavior. They believe that teachers' innovative application of ABRA software, effective teaching content, and high attitude and interest will help teachers play their role in software applications and promote students' performance (Mak, 2017).

To integrate the effects of ABRA software in different countries and periods, Abrami et al. conducted a meta-analysis of 11 related experiments from Australia, Canada, and China. They found that the overall effect size was 0.179. Among the six skills, improving listening comprehension ($g=0.381$) and phoneme awareness ($g=0.324$) has

the most significant effect. At the same time, Abrami believes that the organization and implementation of these experiments are homogeneous, and therefore did not sub-analyze the reasons for the differences in performance of these studies (Abrami, 2015). Based on the above research, it can be seen that ABRA software has a particular effect on the improvement of students' abilities, but the degree could change according to related factors.

Most existing research explores the software implementation process, methods, and results combined with teachers' teaching methods and strategies. Although the students' gender, economic background, and other factors are discussed, there is a lack of comparison. At the same time, according to the critical period hypothesis of second language learning, students have a certain critical period for second language learning. Still, researchers do not have a consistent conclusion on the boundary of the critical period (Snow & Hoefnagel-Höhle, 1978). Therefore, it is necessary to discuss the English learning progress of students of different grades. At the same time, in the existing research in China, there is a lack of experimental research on electronic teaching software to improve student's English ability (or second language learning ability). Based on American positivism research tradition and methodology, evidence-based research has gradually become the mainstream of its educational research paradigm. This paradigm emphasizes the design of the quantitative analysis, experimental research, and discussion of causality and related relationships. It aims to seek the best evidence and provide specific practical approaches for school reform.

In the few existing experimental studies, due to the lack of standardization of experimental design, insufficient scientific measurement tools, and improper data processing methods, the scientificity and robustness of the conclusions are difficult to guarantee (Lei, 2007).

In response to this, this study used ABRA software to carry out experiments. In comparison, the software had undergone the scientific and rigorous software tools tested by previous experiments. Its framework design, content arrangement, and testing tools had been fully demonstrated and continuously improved in the conclusions. At present, preliminary research has been carried out in many countries and regions around the world. Therefore, the study will take Ganyu Huajie Bilingual School in Lianyungang City, Jiangsu Province, as an example, focusing on students' performance in graders of one, two, and three and different teachers' teaching strategies. We used ABRA software to explore the path and best plan for computer technology to assist students in improving their English proficiency in the Chinese context.

Research Design and Methodology

To explore the improvement of the English ability of elementary school students by the ABRA project, this study adopted a pre-test and post-test quasi-experimental research design. The study conducted a mixed research design and didn't change the existing class framework to implement the experiment. Through qualitative research, random classroom observations were conducted on the teachers of the experimental group and

the control group. After the experimental intervention, the three experimental group teachers and the English group lesson preparation directors were interviewed to understand the teacher's feelings, attitudes, and other influencing factors to explore the experimental results and the causes and mechanisms of differences between the groups. The intervention period was the second semester of the 2018-2019 school year, from February 26, 2019, to June 14, 2019, which lasted 16 weeks.

Subjects

The research team included 956 students in 24 classes from Grade 1 to Grade 3 of Ganyu Huajie Bilingual School in Lianyungang City, Jiangsu Province. In class grouping, to avoid the "observer effect" from affecting the students in the control group, none of the teachers in the experimental class participated in the teaching process of the control class. The study included four classes in the first grade, three classes in the second and third grades, with a total of 398 people as the experimental group. Conversely, four classes were included in the first grade and four in the second and third grades, with 558 students as the control group. The conditions of the 23 classes participating in the experiment were the same, and there were no significant differences in grades, family background, and gender structure.

To ensure the accuracy of the calculation of experimental results, this study first deleted the invalid pre-test and post-test questionnaires and obtained 726 valid pre-test papers and 772 post-test questionnaires. The effective questionnaire rates were 81.06% and 75.94%. Considering the rationality of the arrangement of testers during the experimental test and the adaptability of elementary school students to unfamiliar questions, the return rate of this questionnaire is still within a reasonable range. Secondly, to focus on the changes in each student's performance and avoid the resulting error caused by the student transferring, dropping out of the experiment, or having only one test score, student matching was performed on the before and after test scores after invalid scores were deleted, and finally a total of 614 effective questionnaires were obtained (**Figure 1**).

Selection and Training of Teachers in Experimental Group

Teachers were randomly divided into experimental group or control group. Experimental members follow the school's system of dividing classes according to student scores every year to ensure that each type is equally divided. Therefore, no additional pairing was made between the participating teachers and the class to ensure that the experiment was natural. The number of teachers in experimental groups and control groups were shown in **Table 1**. There was no significant difference in teaching year and lesson preparation between teachers in experimental group and control group.

In the intervention, teachers' training was only for teachers in the experimental group. Trainings were divided into online and offline methods. Online communication

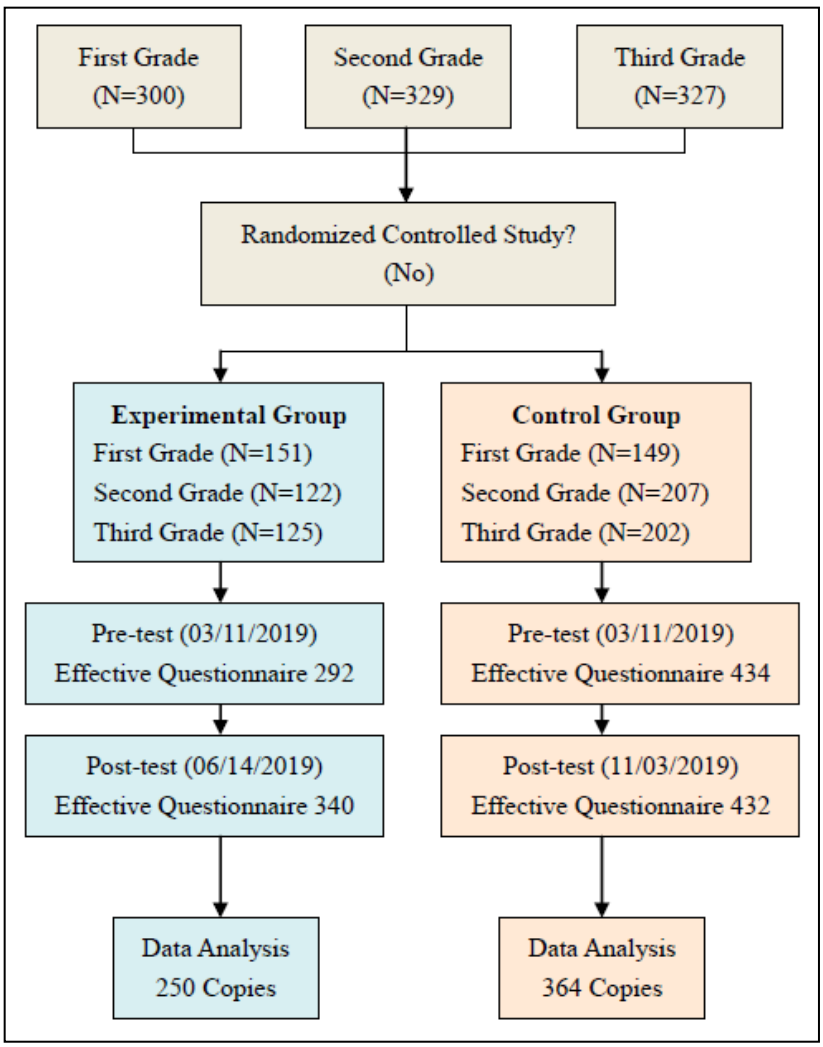

Figure 1. The Graph of the Number of Students in the Experimental Group and the Control Group.

focused on real-time answers to questions and sharing teaching materials and experience; offline discussions focused on possible problems and problem-solving strategies after the ABRA game was applied in reality. Teacher training was mainly divided into three stages. The first stage of teacher training started in February 2019. The research team formally established an online communication channel and entered the school to meet face-to-face with teachers to communicate about the background of the game and the design of the game itself. The second training phase began in April 2019, focusing on the teacher's solution to operational problems. After observing the classroom, the teachers of the experimental group discussed and made suggestions on the time alloca-

Table 1. Comparison of the Class Allocation and the Number of Students between the Experimental Group and the Control Group.

	Experimental Group			Control Group		
	Teacher	**Class #**	**Total Student #**	**Teacher**	**Class #**	**Total Student #**
First Grade	A	4	151	D	4	149
Second Grade	B	3	122	E	3	121
				F	2	86
Third Grade	C	3	125	G	3	120
				H	2	82

tion, operation, student attention, and systemic aspects of the teaching process. The third stage of the school training started in May 2019. This stage focused on motivating teachers and summarizing the situation, avoiding the slack mentality of teachers at the end of the experimental stage and the pressure of the final exam.

Teacher Intervention

Teachers in the experimental and control groups had the following differences in teaching content, including class organization, and teaching methods. In terms of the content and teaching method, the control group teachers were required that the class continue to follow the *Elementary School English Curriculum Standard (2011 Edition)* and completed the textbook content per the related courses. The experimental group teachers were required to teach the Phonics method through the ABRA game, requiring no less than 80 minutes of intervention time per month. The specific intervention time depended on the teacher's teaching rhythm. The experimental group teachers also adopted the class teaching system in class organization, mainly set up as the teaching link of "teacher question-student answer-teacher summary". In terms of specific operations, the teachers in the three grades fully considered the different learning stages of the students in the three grades, and their teaching focuses were different. Based on the English foundation of the students in each grade, the first-grade teachers focused on using the natural phonemes in the game to consolidate the writing and pronunciation of the letters. The second-grade teachers attached great importance to expanding words in games and improving students' interest in English learning. The third-grade teachers paid more attention to the classification, regularity, and way of summarizing comments.

Research Tools

This study used the Group Reading and Assessment and Diagnostic Evaluation (GRADE) standardized questionnaire developed with Canadian language and education

measurement experts. It was primarily conducted in the United States, France, India, Canada, Denmark, and other countries. It has been recognized by international counterparts and has a scientific and authoritative standardization test of English proficiency. Its standardized scope can cover the mastery of English reading skills from preschool children to adults and aims to help the students improve their English ability in the assessment. The test paper is divided into eight parts, which test the ability of students to master the same (different) words required for natural spelling, the ability to recognize rhymes, matching syllables and letters of the first and last letters in a word, letter recognition, and first and last syllable recognition. The questionnaire has a high degree of internal consistency (0.95-0.99), replica reliability (0.81-0.94), and test-retest reliability (0.80) (Williams, 2001).

The research team also used unstructured interviews. For example, interviews were conducted on teachers' teaching methods, self-rating, ABRA game application attitude, ABRA software suggestions, etc., to better analyze the results of each grade.

Analysis Method and Power Estimation

To determine the difference between the experimental and control groups after the intervention, this study calculated the effect size to reflect the effect of the ABRA game on students' English ability improvement. The effect size calculation formula is:

$$d = \frac{m_{post-t} - m_{pre-t}}{s_t} - \frac{m_{post-c} - m_{pre-c}}{s_c}$$

Among them, *d* represents the experimental effect, that is, the effect size of the experimental group minus the effect size of the control group. The effect size of the experimental group is the difference between the mean of the post-test and the pre-test, divided by the combined standard deviation. $m_{post\text{-}t}$ and $m_{pre\text{-}t}$ represent the mean value of the experimental group's post-test and the experimental group's pre-test, respectively. s_t represents the combined standard deviation of the experimental group. The effect size calculation process of the control group is the same as that of the experimental group.

In order to verify whether the sample size reaches the necessary statistical test power, we selected the effect size d = +0.20 and statistical test power $r^2 = 0.80$ that showed that the effect has policy influence. The power test result showed that 80% of the test power could be guaranteed with a sample size of more than 200 (Wu & Wen, 2011).

Results

In What Works Clearhouse (WWC), a comprehensive website of educational evidence designed by the Institute of Education Sciences (IES) in the United States, to ensure that the effect size accurately reflects the impact of experimental measures on students and to reduce the great difference in students' cognitive models for the experimental error,

the effect size of the vast difference between the experimental group and the control group was set to be less than 0.25 (Clearinghouse, 2020).

The results of the pre-post test difference between the experimental group and the control group in this study showed that in the overall difference between control group and experimental group was less than 0.25, which is a slight difference. Thus, it showed that the difference of pre- test was effectively controlled (**Table 2**).

English Test Results

The effect on grade one, two and three was different The performance improved a lot in the first and third-grade students, and the first-grade students benefited the most. The ABRA game did not significantly affect the second-grade students. The following part will be based on the specific analysis of the performance of each grade on each test item.

First grade. The first-grade students have made significant progress in all items in the GRADE test (except for recognizing the *same words* and recognizing syllables in the last letter). Among them, the matching of notes at the end of words and recognition of letters was a significant effect (d=0.83, d=0.80). In addition, considerable progress has been made in word rhyme (d=0.58), word-initial matching (d=0.73), as well as different word recognition and initial listening recognition (**Table 3**).

Second grade. After the ABRA game, the second-year students did not achieve significant progress in each GRADE test item. There was only a tiny effect on the recognition of different words. Because the statistics were not substantial, it was impossible to reject the null hypothesis; there was no significant difference between the two groups in different word recognition abilities after the intervention (**Table 4**).

Third grade. In general, the third-grade students progressed after receiving GRADE game intervention, but word-initial matching showed insignificant effect size results. However, it has improved recognizing the same word, different dishes, and letter matching at the end of a word, letter recognition, and syllable recognition of the first (final) letter. Especially in the word rhyme (d = 0.43), the improvement effect of students' performance was the greatest (**Table 5**).

Classroom Observations Results

There were significant differences between the introduction of ABRA games and the traditional classroom teaching mode on teachers and students in the classroom observation results.

In the course of teachers' teaching, the experimental group teachers showed attention to pronunciation. They were more active in letter pronunciation, syllables, and word memory links, and they had fewer professional errors such as misspellings and mispronunciations in presentations. In the form of teaching, the activities of ABRA could be used flexibly to stimulate students' interest in English learning. They could be combined with books to expand and consolidate words. The teachers in the control group paid more attention to the interpretation of the meaning and the repeated reading

Table 2. The Pre-Test Differences between Experimental Group and Control Group.

	Experimental Group (N=250)		Control Group (N=364)		
Test Item	**Mean**	**SD**	**Mean**	**SD**	**Cohen's d**
Total Score	39.26	7.85	40.74	6.90	0.20
Same Word Recognition	4.84	0.51	4.84	0.56	0.00
Different Word Recognition	3.80	0.62	3.89	0.38	0.19
Word Rhyme	4.85	1.80	4.88	2.02	0.01
Match the First Letter of a Word	3.57	1.65	3.59	1.38	0.01
Match the Last Letter of a Word	3.89	1.69	3.88	1.65	-0.01
Letter Recognition	7.92	2.76	8.63	2.40	0.28
Initial Syllable Identification	5.61	1.85	5.94	1.48	0.20
Last Letter Syllable Discrimination	4.79	1.63	5.11	1.49	0.21

SD: Standard Deviation.

Table 3. Changes in First Grade English Scores.

	Experimental Group (N=67)		Control Group (N=59)		
Test Item	**Pre-test**	**Post-test**	**Pre-test**	**Post-test**	**Cohen's d**
Total Score	30.52 (5.77)	38.15 (7.77)	33.68 (5.37)	36.05 (8.05)	0.77***
Same Word Recognition	4.78 (0.67)	4.55 (1.05)	4.8 (0.66)	4.66 (0.91)	-0.08
Different Word Recognition	3.61 (0.81)	3.45 (1.03)	3.9 (0.3)	3.64 (0.86)	0.22
Word Rhyme	3.99 (1.66)	5.55 (2.05)	4.53 (1.67)	5.05 (2.27)	0.58**
Match the First Letter of a Word	2.66 (1.37)	2.96 (1.21)	2.81 (0.98)	2.31 (1.05)	0.73***
Match the Last Letter of a Word	2.79 (1.54)	3.31 (1.41)	2.93 (1.42)	2.32 (1.28)	0.80***
Letter Recognition	5.39 1.95)	7.3 (2.46)	6.2 (2.33)	6.27 (2.67)	0.83***
Initial Syllable Identification	3.67 (1.68)	6.01 (1.71)	4.39 (1.5)	6.19 (1.95)	0.35
Last Letter Syllable Discrimination	3.64 (1.44)	4.82 (1.65)	4.12 (1.39)	5.42 (1.82)	-0.05

*Note: The asterisk * indicates the result in the independent sample t test, *p < 0.1,**p < 0.05, ***p < 0.01.*

Table 4. Changes in Second Grade English Scores.

	Experimental Group (N=77)		Control Group (N=136)		
Test Item	**Pre-test**	**Post-test**	**Pre-test**	**Post-test**	**Cohen's d**
Total Score	40.94 (5.87)	46.96 (8.96)	38.04 (5.26)	49.53 (5.16)	-1.41***
Same Word Recognition	4.83 (0.47)	4.78 (0.75)	4.84 (0.53)	4.89 (0.34)	-0.2
Different Word Recognition	3.86 (0.53)	3.91 (0.4)	3.84 (0.49)	3.83 (0.54)	0.13***
Word Rhyme	5.09 (1.56)	8.97 (3.01)	4.2 (1.89)	8.31 (2.01)	-0.49***
Match the First Letter of a Word	4.58 (1.6)	3.68 (1.2)	3.45 (1.3)	3.81 (1.15)	-0.94***
Match the Last Letter of a Word	4.32 (1.52)	4.62 (1.34)	3.34 (1.53)	5.18 (1.02)	-1.22***
Letter Recognition	6.73 (1.92)	7.88 (2.53)	7.45 (1.83)	8.68 (1.94)	-0.14***
Initial Syllable Identification	6.22 (1.15)	6.94 (1.13)	5.92 (1.45)	7.43 (0.7)	-0.7
Last Letter Syllable Discrimination	5.3 (1.49)	5.61 (1.5)	5.01 (1.49)	6.63 (1.07)	-1.03***

*Note: The asterisk * indicates the result in the independent sample t test, *p < 0.1,**p < 0.05, ***p < 0.01.*

Table 5. Changes in Third Grade English Scores.

	Experimental Group (N=106)		Control Group (N=169)		
Test Item	**Pre-test**	**Post-test**	**Pre-test**	**Post-test**	**Cohen's d**
Total Score	43.58 (5.5)	48.53 (6.0)	45.37 (5.07)	48.6 (5.4)	0.24**
Same Word Recognition	4.88 (0.43)	4.93 (0.25)	4.85 (0.54)	4.83 (0.59)	0.19
Different Word Recognition	3.88 (0.51)	3.84 (0.58)	3.93 (0.29)	3.83 (0.63)	0.15
Word Rhyme	5.23 (1.87)	8.18 (2.36)	5.54 (2.02)	7.64 (2.32)	0.43***
Match the First Letter of a Word	3.42 (1.45)	3.43 (1.03)	3.96 (1.43)	3.7 (1.14)	0.22
Match the Last Letter of a Word	4.26 (1.59)	4.08 (1.41)	4.64 (1.46)	4.34 (1.31)	0.09
Letter Recognition	10.38 (1.34)	10 (1.28)	10.42 (1.22)	10.09 (1.08)	0.00
Initial Syllable Identification	6.4 (1.44)	7.36 (1.06)	6.49 (1.06)	7.22 (1.01)	0.05
Last Letter Syllable Discrimination	5.14 (1.48)	6.08 (1.4)	5.53 (1.35)	6.41 (1.07)	-0.07

*Note: The asterisk * indicates the result in the independent sample t test, *p<0.1,**p<0.05, ***p<0.01.*

of words and texts. They did not pay much attention to the role of activities in English learning.

In terms of student performance, the students in the experimental group showed more enthusiasm for English learning, were willing to improve their English ability in activities, and showed extremely high sensitivity in word pronunciation and syllable reflection. Compared with the students in the control group, the students in the experimental group were more fluent in reading texts and words; they mastered more quickly in performance and sentence comprehension; they did not show too much fear in the face of unfamiliar words and sentences patterns. On the other hand, the experimental group had some difficulties in class organization. Students were particularly excited about the activities they were interested in. Therefore, teachers in the experimental group needed to maintain classroom discipline and focus students' attention on teaching knowledge.

Teacher Interview Results

To understand the role of teachers in the use of ABRA games, this study further designed semi-structured interviews. We interviewed the experimental group teacher A, teacher B, teacher C, and director D of the English teaching and research section in the first, second, and third grades. To further analyze the teacher's application of the software in preparation, class, after class, and the teacher's psychological state.

The changes in the psychological state of the teachers were relatively consistent, which was a change from semi-acceptance to acceptance to active integration. The second-grade teacher B said frankly, "I didn't teach very carefully at the beginning. It was not until your second visit that I prepared more seriously and used it more." The underlying reason was that teachers were more or less burnout due to heavy tasks. The first-grade teacher A also said that this was an important reason he could not fully accept the ABRA game initially. She took half of the first-grade class (4 classes), a class of about 40 students, and "If a child's learning foundation is weak and sometimes feels that it is too late to complete the task of the textbook." Teacher C worried, "I am afraid that the grades of our third-grade students will fall in the city's unified exam."

After the first stage of use and the second stage of training, teachers generally responded well. Because I found that "some syllables can also be memorized together with words in the book" (Teacher A); "Students are particularly interested and feel that they can teach students interesting English" (Teacher B); and "I am also familiar with ABRA, unlike It was so difficult at the beginning" (Teacher C). In the third stage, teachers had their innovative understanding of games. The first-grade teacher A felt that "using the game of Same Words, sometimes we could review the words we have learned", and found that this was not just an English tool that can only be played.

In the interaction with students and student feedback, teachers said that students like this software very much. "Sometimes I don't need to say, when I was about to open this software, they would shout 'ABRA time' together." (Teacher B) "Because they liked it so much, they suddenly became noisy and I found it hard to keep the disci-

pline." (Teacher B) Moreover, Teacher B also said that sometimes "Students pay all their attention to the game, and we had no time to explain the knowledge in the games." Teacher A also thought that some words are still too difficult for first-grade students and can only be skipped or introduced roughly. It is difficult for students to remember and apply after class. Many of them were a bit like left-behind children, because their parents were too busy at work, and grandparents could take them to play at home"(Director D) and "the family background is not good, most of the homes do not own computers" (Teacher A, Teacher B, Teacher C)

In this study, the experimental results of the second grade were not ideal, and the teacher interviews also deliberately explored the reasons. Teacher B of the second-year experimental group also expressed his thoughts on the experimental results of the first semester. "When teachers in the control group were teaching words, they would consciously use natural phonics to their students." This showed that the students in the second-grade control group were also exposed to natural phonics. Although there were two random classroom observations, teachers who could know in advance usually wanted to "have something to show" (Director D), so they avoided vocabulary teaching in the classroom observation class and focused on the reading and performance of the text. Therefore, the two classroom observations found no signs of using natural spelling by the teachers in the control group.

Teachers also had some opinions on the improvement of the software, especially in picture books. In terms of the display form of picture books, "Students are not very interested in picture books; they just look at the pictures and read. If there are vivid animations, and be shorter, students could learn easier." (Teacher B) Regarding the difficulty of the picture book, Teacher C believed that the content of the picture book was too straightforward sometimes but too tricky for the third-grade students, so it was too difficult to make a correct choice. I hope that the school could build the computer room as soon as possible, because "if students play by themselves, it will be better than I teach them how to play. At that time, it will be difficult to manage discipline and teach one by one" (Teacher B).

Conclusion and Discussion

The study results found that ABRA software teaching positively affects students' English, especially phoneme awareness. On the one hand, the results confirmed that natural spelling, as an intermediary for second language acquisition, can decode words to deepen students' vocabulary memory, improving spelling, writing, and reading comprehension abilities (Peng & Tao, 2009). At the same time, it is consistent with the research conclusions of teaching natural phonics in the Chinese context, which proves the universality of natural phonics to improve students' pronunciation (Jiang, 2016). On the other hand, the research results support the positive effects of e-learning software on students after being used in the classroom. Based on the double coding theory, the information organization form of the combination of audio-visual can retain complete information so that students can better full reading in animation than static images. At

the same time, the storage space of each channel is limited. As each type of storage space has a mutually independent memory system, vision and hearing can become "assistants" to each other's memory (Mak, 2017).

However, the performance of each grade is not the same. From the point of view of the progress value of the experimental group itself from the post-test to the pre-test alone, the progress of grade one to grade three tends to decrease gradually. Studies have shown that 5-7 years old is a crucial period for children's word order development, and students' native language ability will continue to grow at this stage. The work to be done in the stage of mother tongue transfer becomes more complicated, and the difficulty of second language learning will increase (Qi, 2009). From the point of view of the software effect size of the control group and the experimental group, the research results show that the experimental group of the first grade has made the most progress; followed by the experimental group of the third grade. The reason may be the first and second-grade teachers' excessively active phoneme intervention. In teacher interviews and reflections on practical training, the research team found that the second-grade control group teachers understand natural spelling. She has a mentality of "not falling behind" after the teachers of the experimental group started the natural spelling experiment. Therefore, the teaching of "natural spelling" was also increased in the class so that the experimental group of the second grade did not show more advantages as a whole. Second, student attention was closely related to second language acquisition based on electronic software. Compared with students in the first and third grades, second-year students can quickly learn the games in the classroom after a preliminary understanding of English. However, since there is no suggestion of complete rule awareness in the class, it is often difficult for students to maintain teaching discipline in ABRA games. At the same time, students will not concentrate on learning phoneme knowledge points but only pay attention to the game links, which affects the second-grade students' acquisition of ABRA learning effects (Ding, 2012).

The overall results of students in each item were also consistent with the research results of Jiang's application of natural phonics to third-grade vocabulary teaching. The students in the experimental group had superior performance in vocabulary spelling and spelling, phonetic awareness, and vocabulary selection ability (Jiang, 2016). More specifically, students have improved their letter matching ability and phoneme recognition ability to a greater extent, which was also consistent with the performance of Mak's various topics (Mak, 2017). The difference in the speed of progress in multiple fields is that, on the one hand, the teacher focuses on the listening discrimination of phonemes according to the level and stage of the students' natural phonics during the teaching process. On the other hand, due to identifying initial and ending letters and matching the beginning and end of words, students need to come up with the word's correct spelling in their minds and then look for the correct answer on the test paper. Students will fail to choose the correct answer because they cannot recall the right words or recall them promptly. Mak et al. also mentioned that students of second language learning need to construct brand-new words in their brains in some questions, which will increase the difficulty of the questions (Mak, 2017).

Study Limitations and Perspectives

Based on natural spelling, this research is aimed at Ganyu Huajie Bilingual School in Lianyungang City, Jiangsu Province, on the ABRACADABRA software. It is found that teaching based on electronic software can significantly improve students' English ability. This proves the applicability of the "quoted" e-teaching software and the natural spelling teaching method in the local English teaching process and also shows the positive role of promoting school digital teaching. It is also a reasonable attempt to build a "college-school partnership". However, the implementation effect of e-teaching will vary due to the school's software/hardware conditions, teachers' teaching style, and teachers' mastery and understanding of e-teaching. Moreover, in this project, due to the limitations of funds, time and personnel, the experiment failed to fully guarantee the "non-intervention" behavior of the teachers in the control group. Therefore, although the research conclusion proves the practical function of natural spelling and ABRA software, this deficiency affects the robustness of the local findings to a certain extent.

In the future English teaching process, we should first teach natural spelling in the lower grades. The study results found that the progress of lower-grade students is more significant than that of upper-grade students. Educators should abandon the prejudice of low-grade students' low learning efficiency and weak adaptability, and they need to face up to the plasticity of low-grade students. Teachers need to pay attention to the transfer of knowledge in the game and establish the awareness of students' rules in the interaction between teachers and students to enhance students' interest. The process of e-learning should be promoted. The research results support the positive impact of audio-visual multi-dimensional electronic teaching tools on student performance. Schools should actively arrange funds to upgrade electronic teaching software, strengthen the training of teachers in the use of electronic teaching, and strive to strengthen teachers' teaching levels and promote the diversification of teaching methods. Teachers should also avoid "playing games for the sake of games" in the teaching process. It is necessary to clarify teaching objectives, apply teaching methods rationally, and strengthen systematic and efficient instruction.

The importance of experimental research lies in the ability to provide detailed experimental procedures and results for evaluation. The accumulation of experimental research can provide educators with effective and comprehensive teaching strategies, reducing new programs' "trial and error" costs. On this basis, comprehensive and systematic teaching measures can provide principals, teachers, and students with effective experimental programs in many aspects and help education policymakers' reference. This research presents a relatively standard experimental process to promote the development of experimental research in the direction of education. Based on the continuous improvement and advancement of experiments in English learning, more and more verifiable application models of English e-teaching software will be developed in the future. In the case of meeting the development needs of students, we should pay attention to the applicability and comprehensiveness of software and electronic applications in local contexts while adapting to the differences between schools and teachers.

Notes

1. *The experimental reports of Hunan and Nanjing have not yet been published.*

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ORIGINAL ARTICLE

The Italian Leadership on Inclusive Education: Myth or Reality?

Francesco Marsili, Annalisa Morganti, Alessia Signorelli

University of Perugia, 06123 Perugia PG, Italy

***Abstract**: Background: Italy is internationally known as a Country with a longstanding "tradition" of inclusive education.*

Objective: Aim of the paper is to provide a frame on the educational policies that, since 1970s, have steered the school system according to a "fully inclusive" model, highlighting the instruments of teaching – learning and evaluation tools for assessing the quality of the inclusive processes.

Methodology: Starting from primary and secondary legislative sources, the paper identifies three main focus points: the passage from the inclusive "principle" to the teaching – learning practices; the tools for answering special educational needs; the tools for assessing the quality of inclusive processes.

Discussion: Even though there are many efforts to align to international legislative regulations and to modernize the concept of inclusive education, Italian reality seems to be ossified in self-referential attitudes, beliefs and practices that saturate the school system. The paper outlines the need for defining new systemic research approaches that can validate this long educational tradition.

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About the Authors: *Annalisa Morganti, Associate professor in Special Education at University of Perugia, 06123 Perugia PG, Italy. E-mail: annalisa.morganti@unipg.it*

Alessia Signorelli, Research Fellow in Special Education at University of Perugia, 06123 Perugia PG, Italy. E-mail: alessia.signorelli@gmail.com

Correspondence to: *Francesco Marsili, Ph.D. student, Human Sciences, University of Perugia, 06123 Perugia PG, Italy. E-mail: francesco_marsili@hotmail.it*

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Introduction

IN the international horizon, Italy is considered a leading Country in the field of inclusive education (Begeny & Martens, 2007). Starting from the 1970s, thus gaining half a century of experience and expertise, Italy contributed meaningfully to the development and renewal of inclusive school policies.

Aim of this paper is to provide a general frame on three main features of Italian school system concerning inclusion: educational policies, instructional tools and practices and, finally, evaluation and assessment of the whole system from an inclusive perspective.

After a first and delimited historical time period characterized by segregation and exclusion of students with disability from the main school system, Italy progressively proceeded in dismantling a "special" school approach through specific laws, opening the path to educational assimilation first and integration then of these students for the period covering mandatory inclusion. It was not until the 1980s that the right to education was extended to all students with disability also for the period of secondary school and only in 1990s such right was extended to kindergarten/early childhood education and care and University.

From age 0 to age 20 and beyond, still today, all students with every kind of disability, even the most severe, have access to mandatory and optional education, benefiting from a specific legislation regulating this path, recurring to paths and tools specifically defined that allow for personalizing and individualizing the teaching – learning processes.

The paper, through an historical – legislative excursus highlighting also the main theoretical models that evolved in the course of the time, addresses the current situation of the Italian school system from an inclusive perspective. This is done via the description of the most recent innovations in the educational laws area. Some critical issue highlighting an often-pronounced asynchrony between intention and implementation, between legislative evolution and educational research are also tackled.

National laws have brought to educational reflection and research's attention the methodological and instructional aspects usually solidly connected to the principle of school inclusion. In detail, the paper analyzes two instruments that in the daily teaching – learning allow for each teacher to make this very principle evident: the Individualized Educational Plan and the Personalized Instructional Plan. The different denomination, the different student population addressed and, most of all, the different use of these instruments and the recent developments are specifically discussed.

In the face of such large and brave legislation, of the many processes and products that in the course of the years contributed to giving Italy an international leadership position in the field of school inclusion, it is crucial to highlight that the validation of the historical choices made, beside many lights have also some substantial grey zones.

In its final part, the paper addresses the theme of assessing and evaluating the inclusive school system, a pivotal point in the validation of this long historical tradition that had really contributed to modifying, improving, and innovating a whole system.

The Italian Way to Inclusive Education between Past and Future

The European document Support for Children with Special Education Needs (European Commission, 2013) describes the differences between the school systems of the various Member States of the European Union. It outlines how, notwithstanding EU regulations, recommendations and reports (UNESCO, 1994; UN, 2016; Watkins, 2012) provide a clear direction for what concerns the measures to take from an inclusive perspective together with the possibility for students with Special Educational Needs (SEN) of attending mainstream schools, there are still in some Countries educational realities that show the persistence of special schools or classes.

Even though the legislation, organizational, theoretical and practice framework in each national context appears to be quite heterogeneous in relation to the topics of inclusive education, therefore jeopardizing both the comparison of the systems themselves and the assessment of the efficacy of the inclusive practices (Cottini & Morganti, 2015), the term "inclusive education" seem to reflect a model that takes on a general, rather shared meaning according to which inclusion means essentially assimilating students with SEN in mainstream classes (Nepi, 2013).

Italy, a unique case of 50 years of expertise in the field of inclusive educational policies in OCSE Countries, contributed meaningfully to the improvement and the overcoming of this narrow, reductive theoretical vision, dealing with the "challenge" of inclusion, starting from the 1960s and playing the role of both avantgarde and turning point at international level (Begeny & Martens, 2007). The Italian model, as a matter of fact, represents an example of national policy that ensures access to all children and youths to school, from kindergarten to university, whichever their condition, even with severe disabilities (Ianes & Dell'Anna, 2020).

Together with the changes occurred in the psychiatric field, Italy dismantled the "special" school system, opening to school integration (law 118/1971; law 517/1977) following a document of the parliamentary committee presided over by MP Falcucci, in 1975, that had already observed that "The whole school structure, particularly compulsory education, can and must decisively contribute to the overcoming of every situation of human, cultural and social exclusion that has its roots in the failure of the development of potential of the individual" (Circolare Ministeriale, 1975).

In this historical phase the concept of "assimilation" first and "integration" later covered an important role both in the pedagogical debate and the scholastic realities, were the introduction of the support teacher in each class in which there was a student with a certified disability represented an innovation and an element for an epistemological and methodological – instructional reflection.

Within this complex educational and policy framework (it is important to remember that in Italy there weren't different political stances on inclusive policies, not for what concerns their promulgation nor their implementation), the historic route to-

wards inclusion presented the educational community with a cultural more than implementational issue.

If the assimilation in "normal" classes concerned mainly children and youths with disability, integration broadened the horizon of diversity, intercepting the students' needs, whichever they were, through a rethinking of the paradigmatic structure of diversities, differences and their related models (Sannipoli, 2015).

This theoretical shift corresponded to the succession and integration of different models: the clinical model, which sees disability as a problem of the person caused directly by a pathological condition linked to neurobiological determinants, and foresees the intervention of specialists in this field; the social model (Oliver, 1990) which, referring to the current of the Disability Studies (Medeghini et al., 2013) that challenges the assumption that causally connects impairment with being disabled, strongly emphasizes the context as the main obstacle to the full development of the person with disability. Therefore, according to this vision, society must be rethought and redesigned to cater for the needs of people with disabilities. These two models are synthesized in the framework law n.104 of 1992. Such law was concerned, and still is to these days, with social instances while aiming at ensuring full rights to persons with disability during their lifetime and in every context, from the educational to the job world.

The Italian way to a fully inclusive school model brought advancement in many fields of education. Particularly, an important innovation of the school system has been partially fulfilled by the law on the school autonomy (Presidential Decree n. 275/99), that gave each Italian school an organizational and most of all curricular flexibility that would allow each institute to adjust itself to its varied socio-cultural context. In this sense, the education provided by each school must globally and systemically tend towards an adjustment, in order to answer to the needs of the students of that specific area, which is often characterized, in some places of the Italian territory, by socio – economic disadvantage or linguistic poverty.

The model of integration defined by Mitchell (2014) as "locating learners with special educational needs part-time in regular classes" (pp.298), was to be overcome in Italy with the coming of the capability approach whose underlying philosophy is the idea of quality of life, of well-being theorized by Amartya Sen (1993). This quality does not depend much on the means that each individual has at their disposal, rather on the ability to turn them in concrete actions and achievements oriented towards the life goals each one wishes to pursue.

The accent is on the real possibility of choosing actions, goals, and life plans to set and achieve, and within this freedom lies the concept of social justice. Overcoming disability does not equal to adjusting to "normality", rather it means broadening the individual's possibility of choice. Another innovation is represented by the International Classification of Functioning, Disability and Health (OMS, 2001), which saw the realization of the global collective effort of 191 Countries in order to embed all the models previously described in the biopsychosocial paradigm. However, in this phase between the late 1990s and early 2001, this "Copernican revolution" did not hold a legislative

pivotal place in Italy, rather it contributed steering the educational research which conceptualized a "special normality" (Ianes, 2006).

Disability had a central role in laws and educational instances. ICF gave the issue a strongly innovative layer, embedding disability in a much wider frame which, learning from the clinical, social and capability models, has built at educational and school level a bridge between special education and full inclusion (Ahrbeck & Felder, 2020).

Through the ICF's biopsychosocial frame, many interpretations have been given to disability in Italy.

From an educational perspective, disability is understood as "[…] the consequence of the profound interaction between the health of an individual and its life contexts, between personal and environmental factors. Starting from the functioning of each subject, the tool (ICF) possesses a universal value as it is concerned not only with people with disability but with the whole humanity and at the same time it promotes a multidisciplinary reading which allows for dialogue and exchange between different fields: the health one, the social one, the educational one, the clinical one and the statistical one." (Sannipoli, 2015).

What looks to be increasingly predominant is the need for a broader concept of inclusion which focal research point lies in interdisciplinarity.

Inclusion is an evolving phenomenon, socially and historically, which is being shaped as an empowerment movement aiming to a greater autonomy of the individual who becomes increasingly capable of making decisions about their life (Oliver, 1990).

With the ratification of the ONU Convention on the Rights of Persons with Disabilities (2006) through law n.18 of March 3 2009, Italy continues to follow its route towards inclusion, adapting its own rules to international legislative frameworks such as UNESCO's Policy guidelines on inclusion in education (2009) which state that "Inclusive education is a process of strengthening the capacity of the education system to reach out to all learners [...] An "inclusive" education system can only be created if ordinary schools become more inclusive – in other words, if they become better at educating all children in their communities" (UNESCO, 2009).

In the face of such international policies, Italy has increasingly adopted more focused national policies aimed at ensuring everyone the right to accessible education (law 107, 2010; Ministerial Decree /D.M. December 27/2012).

In particular, the D.M. of December 27th 2012 provides a specific direction for what concerns special educational needs which include disability, specific developmental disorders, socio -economical, cultural and linguistic disadvantage, and more recently, gifted children (MIUR, 2019). Actually, we see the opening of a double channel of educational care which entails personalization (Piano didattico personalizzato-Personalized Instructional Plan[1]) as further instructional action which sides the by now consolidated practice of individualization (Piano educativo individualizzato-Individualized Educational Plan[2]).

The inclusive paradigm has increasingly pushed towards participation which surely entails making decisions as well. Such paradigm has become an essential theoret-

ical and reference framework only with the most recent laws (Dlgs 66, 2017, Dlgs 96, 2019) that have integrated ICF theoretical and practical structure, therefore strengthening those changes that step by step, lead to a new inclusive model.

What previously was called integration, was linked to a state, a condition, today inclusion represents rather a process, a philosophy of acceptance, namely to provide students – whatever their abilities, gender, language, culture-with a frame where they can be equally appreciated, respected and given equal educational opportunities (Mitchell, 2017).

From the Principle of Inclusion to Inclusive Educational Actions and Practices

The educational policies for inclusion surely brought an important and remarkable contribution to the Italian school system from many perspectives. In this sense, we must think about instructional planning and design, and the experimentation of new technics and strategies (such as co-teaching, open instruction, differentiation). In particular, the support teacher, a key figure for the whole class and not only for the student with disability, is and always will be the pivot of change and shift towards inclusion, so much to allow us thinking about a future where each class, regardless of the presence of students with disability, will have a support teacher.

From this future perspective, inclusion broadens and permeates every aspect of the educational system becoming its main feature. The way toward inclusion, furthermore, has seen important innovations in the school spaces, a renewing of the learning environment and a technologization of the organizational-instructional structure. Inclusion, therefore, has been the "sounding board" that brought a continuous improvement to the Italian school system on different planes and levels.

In the intertwining of legislation and educational instances outlined until now, we must take into account not only the achievements but also the grey areas that within such a complex and longstanding educational system can lead to further, new developments. An example for this is the access to secondary schools for students with disabilities. There is a lack in the reorganization of the secondary school system that still today endures the model proposed by 1923's Riforma Gentile. This model, even though outdated by the unification of the 3-year junior secondary school (law 1859, 1962), does not facilitate access to high school to students with disabilities who are often pushed towards professional schools. The selection is therefore implicit and unclear, and this goes against the inclusive attitude that should characterize every school, in so far as what the principles of personalization and individualization previously explained call for.

This need is made clear by the data collected by the Ministry of Education[3] for the school year 2017/2018 which show that only 23.8% of the overall population of students with disability attend high schools, while 27.3% attends polytechnic schools, and the majority, 48.9% is enrolled in professional institutes.

We see, therefore, the persistent scarcity of empirical evidence that would give each institution the chance to analyze the issues of the system. As it will be described in the last chapter of this contribution, even though the way towards inclusion had a crucial impact at a systemic level, contributing also to cultural progress, the lack of an evaluation and assessment system for the quality of inclusive education is a gap that must be filled as soon as possible. Even though this is one of the main points in the Italian educational debate on inclusion (Ianes et al. 2020), there is still no change of pace in its actual implementation due the negative convergence of legislative, economic, cultural and practical difficulties which makes more arduous implement and verify the effectiveness of inclusive educational practices and school policies (Cottini & Morganti, 2015). Assessing the quality of inclusion would allow school to steer their educational horizons and find a way to include each and every one.

From this perspective, a snapshot on the current situation of the Italian school system show, on many aspects, an asynchrony between intention and actual implementation, between legislative process and educational research. A reading of the Italian model for inclusion shows the multidimensional connotation of this phenomenon, which is made of a principles level, an empirical evidence level, an organizational level and a methodological-instructional level (Cottini, 2019).

In this first section of the paper, we touched generally all of these levels. It is therefore crucial to highlight how these elements, from this asynchronous perspective, seem to have different paces and rhythms event though pursuing the same goal. In this aspect, the principles level seems to pull and steer the others, uncovering their shortcomings and flaws. The quality of inclusion, as already hinted, has been (and still is) an open debate for quite some years, but the evidence level and the organizational (policy) level seems yet unable to provide prompt answers. Furthermore, the biopsychosocial paradigm, even though it provided the key for understanding disability in terms of functioning, and by reason of the definition of paradigm given by Khun as "Universally recognized scientific conquests which, for a certain time, provide a model of problems and solutions that are acceptable to those who work in a given field of research" (Khun , 2009), could be read as a starting point and not a final destination.

In light of the new approaches to inclusion which look at diversity through an ecological – systemic lens besides functioning, we can hope, while thinking about inclusion, for the paradigm shift that Borland (2005) recalled in the field of gifted education and that Bocci (2021) wished so this concept would not be reduced simply to an elegant yet empty formula.

The paradigm shift is an overcoming of simple definitions and redefinitions, of categorization, of educational sectarism to approach a vision of inclusion oriented towards an educational-instructional action that can answer the needs of all students at all levels, in any environment and stage of life.

The ecological – systemic model for inclusion (Mitchell, 2015; Anderson et al., 2014), in this sense, provides an innovative outlook, which sees in the relation and inter-connections between different systems the only way of realization, outlining how at assessment, instructional, organizational and territorial level it is necessary to train, in-

volve and cooperate with all the players of the educational process: teachers, school heads, families, educators, collaborators, policy maker and specialist. The ecological model, therefore, is the horizon towards which Italy is heading for a broadening of borders of school inclusion that can encompass social inclusion as well.

Methodological Approaches to Inclusive Education in Italy: The Individualized Education Plan and the Personalized Instruction Plan

In the previous chapter, we explored the development of inclusive education in the Italian school system, together with the different frameworks implemented in the course of more than 50 years, outlining the evolution of the Italian inclusive approach to education.

The adoption of such different frameworks represents a number of pivotal shifts not only from a legislative standpoint, but it entails changes also in the more practical area of education, namely in the implementation of inclusive teaching – learning methodologies and strategies.

It is now clear that when we use the term inclusive education, we are referring, as Franceschini argues (2018) to a strongly participative approach to instruction which envisages the sharing of goals, objectives, and assessment methods; this stance is twofolded: on one side, there are ethical issues at stakes because it recognizes the importance of creating a democratic educational community and, on the other, we are faced with instructional issues, as when students are made aware of what is the school's educational plan and objectives, it is more likely for them to successfully reach their goals. This is where the concepts of individualization and personalization coming handy (Franceschini, 2018).

In the first chapter, we briefly touched two tools used by schools responding to these two ideas; the Individualized Educational Plan-IEP (in Italian: Piano Educative Individualization-PEI) and the Personalized Instructional Plan-PIP (Piano Didattico Personalization-PDP). Both are clear examples of how the Italian school system tried to establish a convergence between the legislative and the educational horizon, signifying the efforts put in the pursuit of a quality inclusive education.

However, there are differences in both documents, and differences with regards to the school population they are aimed at.

As a first step, it is important to operate a crucial distinction: the IEP is aimed at students with certified disabilities, while the PIP addresses the educational needs of students with learning disorders such as dyslexia, dyscalculia, and dysgraphia.

Another interesting fact is that while the IEP has been a stable instrument in the Italian schools for almost thirty years, the PIP is relatively younger, having been introduced in the educational system only ten years ago, with the law 170/2010 (later integrated with other memorandums and decrees) which was the first law ever to shed a

light on the educational needs of those students with learning disorders attending Italian schools (Cottini, 2019; Magni, 2015).

The Individualized Educational Plan

The IEP is the document through which the educational and instructional goals for the student with certified disability are identified; even though it is a yearly document – that means it is necessary to revise and review it at the beginning of each new school year to assess its efficacy – the IEP is by no means a "fixed" tool as it is possible – and in some ways desirable – to carry out these actions during the school year as well to allow adjustments and modifications that would properly suit the student's progress, needs or achievement that could emerge in the course of school months.

The IEP is a thorough document which collects a series of crucial information useful for ensuring the educational and social wellbeing of the student; therefore, together with the detailed description of the educational and instructional interventions planned, the goals for the student and the criteria for evaluation and assessment, we also find sections dedicated to the organization of the school hours, a list of activities and the relative methodologies and resources to carry them out, the relationship between the school and the student's extra – school contexts, and the involvement of the families/caregivers. This plurality of circumstances is reflected by the fact that the IEP is drafted not only by the teaching staff, but it entails the participation of families and of all the public health professionals that attend to the student during therapy or rehabilitation activities outside the school. The engagement of these players in drafting the IEP contributes to the integration of additional, helpful information in order to create a more in-depth knowledge of the student which extends to their whole life inside and outside school (Ianes et al., 2010; Ianes & Dell'Anna, 2020; Ianes & Demo, 2017).

Therefore, the document on one hand aims at providing the school teaching staff (and not only the support teacher) with a holistic knowledge of the students both in terms of their functioning and aims of development, and on the other to draft a detailed plan for what concerns the student's goal and the routes to take to achieve them. In particular, special attention is given to the strengths of the students which constitute the foundations on which planning all the activities.

The IEP is part of the Educational and Instructional Syllabus of the School (in Italian Piano dell' Offerta Formativa – POF) which is drafted by every school in Italy to introduce and describe the educational and instructional choices and actions carried out by the institution. In the Syllabus are described also all the actions that the school intends to implement in order to adequately answer to the needs of students with disabilities, therefore acting as a "school plan for inclusion".

In recent years, the IEP has been subjected to significative changes and improvements, the most recent one represented by the intermenstrual decree n. 182 of December 29th, 2020, which defines new ways of allocating the support resources envisaged by the D.L 66/2017 and the new models for the IEP to be adopted by schools.

The changes introduced by the decree provide an interesting landscape which, in turn, paves the way to further reflections about what in the first chapter have been defined as the difficulties of intersection between the laws and the reality of schools' daily life.

The most important of these innovations is, doubtlessly, the fact that in order to fill the new IEP document, the figures involved must now refer to ICF's biopsychosocial approach. If, before, the ICF framework had received wide consensus among the educational community but somewhat remained in the background, now it has gained the forefront, becoming the underlying set of principles guiding the methodological approach to inclusion-especially for what concerns the identification of facilitators or barriers to learning.

The adoption of the ICF framework represents a crucial change not only from a philosophical perspective but also from a practical standpoint; in fact, until now, the drafting of the IEP was made of two preliminary moments exemplified by two preparatory documents: the first one was the Functional Diagnosis (Diagnosi Funzionale)

Ianes et al., (2010) highlighted how its main goal was to get the more in-depth knowledge of the student and its functioning, therefore noting down strengths and weaknesses. However, the authors also stated that this knowledge should have been "educational - functional", namely useful to the daily and actual realization of appropriate, meaningful and effective instructional and educational activities. Further, the Functional Diagnosis was supposed to be seen as an interdisciplinary work; however, the responsibility for its drafting was of the specialist MD, the pediatric neuropsychiatrists and the health professionals– this, according to Ianes et al. (2010) represented a mainly clinical – medical approach that went against the principles of shared tasks and transparency advocated at the beginning of this chapter – besides being a document that would provide little help to teachers for the planning of the individualized instruction thus becoming very little "functional" (Ianes et al., 2010). The second step was the Dynamic Functional Profile (Profilo Dinamico Funzionale) which was produced by the joint work of parents, curricular and support teaches together with health professionals. In the Dynamic Functional Profile were listed the student's strengths and weaknesses cognitive, communication, social, personal and learning areas (Cottini, 2019).

With the introduction of the ICF framework, these two documents become a thing of the past, at least in their formulation, and are replaced by the ICF Based Functioning Profile (Profilo di Funzionamento su Base ICF). Furthermore, the axes over which the strengths of the student are measured and that function as bases for planning the educational activities are divided in four dimensions: sociability and interaction; language and communication; autonomy and orientation; cognition, neuropsychology and learning. These four dimensions synthesize the previous parameters used in drafting the IEP up until last year.

With such a momentous changing, the Italian Ministry of Education has launched a specific section within its institutional website containing all the information – both legislative and practical – to be perused by all the players involved[4] and where is

possible to find information and training materials as the new IEP is still in its more testing phase.

Summing up, in the words of Pasqualotto & Lascioli (2020), "The innovation introduced by the legislation is far-reaching, not only for the impact it has on the organization of the Services and on the procedures relating to school support and accompaniment towards the Life Project. Particularly relevant is the change of perspective brought by the adoption of the anthropological model of the International Classification of Functioning, Disability and Health (ICF). If, so far, the condition of disability has been assessed on the basis of clinical parameters, the Functioning Profile now requires a biopsychosocial assessment of the person which will consider not only deficits and impairments, as well as its effect on the development process of personal experiences (personal factors) and the setting of daily life (environmental factors). Indeed, this threefold focal lens is the only means to comprehend the overall condition of a person with disability – encompassing their needs and wishes – which is intertwined to the quality and the complexity of the social network to which they belong" (pp.43)

The Personalized Instructional Plan

While until now we focused our attention on the methodological approach to inclusive education for students with disability through the analysis of the Individualized Educational Plan, we can now explore another tool used by the Italian school system and especially aimed at students with learning disorders: the Personalized Instructional Plan - PIP

The PIP has been introduced in Italy by the decree n.5669 of July 12th, 2011, containing the guidelines to the implementation of the framework Law 170 (Emili, 2020). The concept of PIP clearly calls to mind the need for a conscious, shared planning of the strategies, actions and instructional tools able to remove the barriers to learning and foster the achievement of students with learning disorders, which are measured on the real needs of the student themselves (Emili, 2020).

The PIP proposes strategies for supporting the student with learning disorders without contemplating the intervention of a support teacher but through the use of compensatory tools and dispensatory devices (Emili, 2020; Della Volpe, 2016; Fogarolo & Ambrosini, 2013). According to Law 170, is responsibility of the teaching staff to identify the best compensatory devices that can support student's learning; these devices are proposed and agreed with the family and the student if they are of age, in order to make them the center of their learning (Della Volpe, 2016).

It is important to clarify the terms; with compensatory devices, we mean all the tools of technological and instructional nature that can facilitate the student's performance and allow them to concentrate on the cognitive aspects of the task; while, with dispensatory devices we refer to all those instructional and educational actions and strategies that relieve the student with learning disorder with performing a task that would be particularly difficult for them and would add nothing from a learning point of view (Della Volpe, 2016; Mansueti & Cardellini, 2018).

Two are the main approaches suggested while working on the inclusion of students with learning disorders: the implementation of an individualized instruction to be carried out during the individual tasks in the class and the personalized intervention that must be measured against the individual differences, carried out through the implementation of different methodologies and strategies while always keeping in mind the general and specific aspects of learning and performance (Mansueti & Cardellini, 2018).

Until this point, we have analyzed the PIP as a document aimed at students with learning disorders but, as Fogarolo and Ambrosini (2013) argue, the Italian legislation on the inclusion of students with SEN in 2012 and later decrees, extended the possibility of drafting a personalization document – still called PIP – for students with SEN as well.

The application of the PIP in the area of SEN is, though, quite different from its use with students with learning disorders from a legislative and educational perspective – however, it can help whenever the teaching staff may encounter a student with a not specified or certified learning disorder (Fogarolo & Ambrosini, 2013). In this case, the teaching staff must motivate the choice that urged them to use a PIP on educational – instructional basis.

Therefore, while it is mandatory to draft a PIP for students with diagnosed and/or certified learning disorders, this is not the case with students with SEN that do not have diagnoses nor certified learning disorders but may show similar difficulties.

Does this Mean Inclusive Quality?

In this chapter we have summarized briefly the two main methodological tools used in Italian schools for the educational inclusion of students with disabilities and learning disorders. However, there are still many issues to deal with. The first one, and the most obvious, in a sense, is the lack of research able to produce sound evidence on the real impact of such tools on the quality of inclusive education.

While there is no doubt about their absolute pivotal role in ensuring access to education to all students, it is important to analyze how their use can produce an improvement on the many educational and instructional processes happening daily in the school. This is linked not only with the way the documents are structured but also to teachers (both curricular and support) readiness in approaching the drafting of these tools with a shared, focused and strong set of inclusive values that should not be reduced to declaration of intents. In the past years, the studies on the IEP in particular have been mainly focused on how to create better models for drafting it (Luciano & Angelo, 2020) or have been of a more qualitative leanings with teachers being interviewed on their actual knowledge of the ICF framework (Chiaro, 2013).

Ianes and Demo (2017) argued how IEP's potential was at risk of being jeopardized by the inefficacy and ineffectiveness of its realization due to the complete lack of well-defined minimum quality standards, while clearly stating that the sole presence of the IEP is not enough to guarantee the quality of the inclusive courses, paths and pro-

cesses offered by the schools, as its sound implementation needs to be carried out standing on quality principles.

While Montanari (2019) highlights how Italian schools should start a route of deep innovation of their "traditional ways" and must therefore review the objectives, methodologies and tools for achieving inclusion (and the extremely recent renovation of the IEP could be one example), it is also clear that it is not possible to think about renovation without testing the system and its components in order to identify "what works and in what circumstances" (Slavin, 2008) for a quality inclusive education.

This, in turn, is heavily linked to the questions concerning how to assess the quality of inclusive education through an evidence – based lens and what is the state of the art of the Italian education system in this regard – a pivotal issue that will be explored in – depth in the next chapter.

Evaluation and Assessment Systems for the Quality of School Inclusion

The first part of the contribution described in detail the sound, historic Italian's "tradition" of a fully inclusive school system. In the face of a school legislation that supported and still strongly supports such model, which entails the presence of every special need, from the most complex and severe disability to different types of disadvantages, it is not possible to ignore some still existing criticalities around the validation of such approach. In fact, the evidence able to substantiate and validate it is very scarce. We can say, in short, that all the conditions and premises to make Italian schools inclusive have been created, but it is also important to evaluate and assess as well how much they really are for the end users and for the whole school community.

In previous works (Cottini & Morganti, 2015; Cottini et al., 2016) we extensively described the limits that characterize the Italian evaluation and assessment systems for what concerns school inclusion; these are the same limits that international literature has much highlighted.

In that regard, Begeny and Martens (2007), argue how in United States many supporters of a fully inclusive educational system have identified Italy as an excellent example of the realization of such policy but, at the same time, they still highlight how scarce is the research in Italy about inclusive practices and their outcomes and results.

The World Report on Disability by World Health Organization, in its most recent update as well (WHO, 2011), does not even cite the Italian model of inclusive education.

The weak link is surely represented by the paucity of applied research carried out with methodologies that can be brought back to Evidence-based Education applied to special education (Cottini & Morganti, 2015; Dell'Anna & Pellegrini, 2019). This limit, in addition to making problematic the validation of the organizational and didactical route of Italian school, does not provide teachers with sound methodological references in order for them to steer their daily work.

Beginning in the Nineties, Italian schools started to pay attention to the evaluation and self-evaluation processes of the whole system, with the aim of a better distribution of resources and collection of the learning results of all students (Fiore & Pedrizzi, 2016). Even though no real, systemic model had been defined, the recent national legislation about the educational inclusion of students with disabilities (DL 96, August 7th 2019) needs to be credited for dedicating special attention to the "Evaluation and assessment of the quality of school inclusion" (art.4) as integral part of the assessment procedures of educational institutions. Entrusted with this process is the National Institute for the evaluation of the educational, instruction and training system (Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione INVALSI) in agreement with the Permanent Monitoring Unit for School Inclusion (established at the Ministry of Education since 1999).

The indicators for the evaluation and assessment of the quality of school inclusion specified by current legislation refer to criteria concerning: the implementation in schools of paths of personalization, individualization and differentiation for supporting students (Individualized Educational Plan and Personalized Instructional Plan); the level of involvement of the different players in the drafting of workplans for inclusion of self-evaluation kind (Plan for Inclusion); use of shared tools and criteria for assessing the learning outcomes of students and their social participation; the valorization of the professional competences of the school staff; accessibility and usability of school's resources, equipment, structures, materials and spaces.

Two are the main criticalities that must be currently highlighted; the first one is that this particular system of evaluation and assessment has yet to be achieved; the second has to do with the fact that such legislation is applied uniquely to students with a disability certification (Law 104/1992).

It is still unclear if this evaluation and assessment system, in its implementation phase, will concern somehow also students with other special educational needs. We should outline that Italian legislation specifically addressing students with disability does not make any reference to students with special educational needs even though, conversely, the laws regulating such needs embeds disability as well in their definition.

The 2012 document promulgated by the Ministry of Education called "Instruments for actions in support of students with special educational needs and territorial organization for school inclusion" (Strumenti d'intervento per alunni con bisogni educativi speciali e organizzazione territoriale per l'inclusione scolastica) makes it clear that in the definition of Special Educational Needs are included three main categories: disability, specific developmental disorders and socio-economic, linguistic and cultural disadvantages. As previously argued in the first chapter, since 2019, this concept has been extending to gifted students as well.

For what concerns the topic of assessing the quality of school inclusion Italy, therefore, must deal with a significative inclination toward new monitoring mechanisms which does not find a correspondence in the facts and actions carried out. Unfortunately, this stalemate perpetrates the lack of evidence on the efficacy of process and products

that can guide and steer school policies towards change and continuous improvement, therefore impacting the decisional process and its implementation.

As recently outlined as well by Ianes and Dell'Anna (2020), the tendency in Italian empirical research, on the side of evaluation and monitoring of the inclusive school system, has been of mainly focusing on the structural and processual aspects, with a clear preponderance on descriptive studies that provide information on current or aptitudinal practices, leaving out important research aspects such as teachers, students and parent's point of view on disability and inclusion, the achievement of learning and social goals, the achievement of students with or without disability or other special educational needs, and on the efficacy of the practices and current intervention (Cottini & Morganti, 2015)

We cannot ignore the real difficulties in obtaining empirical evidence supporting the process of inclusive education (Nepi, 2013) due to the variability of the conditions found within the same special educational needs, the different types of schooling taken into account, the methods, the tools used, the variables measured. These factors do not always allow for an objective and efficient generalization of the results, even beyond the geographical borders.

This leads to deem as determinant for obtaining the most complete and objective evaluation of the benefits produced by inclusion in common contexts in relation to inclusion in special contexts, not only the students' achievement in terms of grades and performance but, most of all, the different variables that from a methodological and organizational point of view contribute in identifying the complexity of the inclusive approach and the quality of inclusive instruction: the organization, the work methodology, teachers' willingness and training, the territorial alliances between the players involved, families' involvement, the quality of the interactions at all levels first of all social and cultural.

In terms of tools for assessing the construct of "inclusion", in relatively recent times, the Index for Inclusion: developing learning and participation in schools" (Booth & Ainscow, 2002), translated in Italian as "Index per l'inclusione" (Booth & Ainscow, 2011/2014), has become an important touchstone in the national context.

The Index, originating from United Kingdom and referring to a social model of disability and educational difficulties, explores the concepts of inclusion and exclusion through three main key dimensions: creating inclusive cultures, producing inclusive policies, developing inclusive practices.

Even if the definition of the indicators and the descriptors is clear, it is still a tool with an enough complex structure, made of about 150 items for each dimension. In the attempt of streamlining the Index's structure and make it more functional for the analysis of inclusion in an organizational model such as the Italian one, we worked on the creation and validation of a tool called "Inclusive Process Assessment Scale" ("Scala di Valutazione dei Processi Inclusivi") thanks to the project "Evidence Based Education: European Strategic Model for School Inclusion" funded by the ERASMUS+ Programme KA2 Strategic Partnership for School (EBE-EUSMOSI project Ref.no.

2014-1-IT02-KA201-003578 – www.inclusive-education.net). This tool has been published in an open access journal in Italian language (Cottini et al., 2016).

In its final version, the scale, after quantitative and qualitative validation procedures, is made of two self-assessment sub-scales, each comprising of 20 items and one sub-scale with 15 indicators for an objective evaluation. Differently from the Index for Inclusion, the factor analysis carried out for the creation of the tool identified two factors that reflect on one hand the school's organization dimension and on the other the instructional practices.

The first dimension, called "inclusive organization", is assessed by the whole teaching staff of the school, including the school head.

Following, an example of item:

All teachers (curricular and support) are involved in the curriculum planning and evaluation in relation to every student (e.g. support activities are not planned, carried out and assessed only by the support teacher, etc.)

The second dimension is about "inclusive instruction" and is analyzed by the class' teachers.

Following, an example of item:

In support of those students that show different kinds of difficulties, are various forms of tutoring by more expert peers.

The scoring for each indicator of the two dimension is on a 4-level scale: 1 when the described circumstance never occurs or it occurs sporadically or it involves only one or very few people, highlighting a "very critical" situation; 2 when the described circumstance occurs rarely or involves only a few people, highlighting "some criticality"; 3 when the described circumstance happens quite frequently or involves the majority of the people, highlighting a "positive" situation; 4 when the described circumstance happens always or almost always or involves all the people, highlighting an "excellent" condition.

The Inclusive Process Assessment Scale, together with the self-assessment on the indicators of the two dimensions on inclusion, foresees the presence as well of questions which refer to objectively detectable parameters.

Following, an example:

How many training and discussion meetings have been organized during the school year on topics concerning inclusion which saw the participation of the school staff?

Options: None – From 1 to 2 – From 3 to 5 – More than 5

Please state the names of the meetings: _____

The use of the Inclusive Process Assessment Scale with vast samples of Italian schools (as well as Spanish and Croatian), thanks to its digital version, allowed both for the assessment of the efficacy of the schools (proved to be more or less inclusive) in terms of achieving the educational and instructional goals of the students, and for the impact of the programs of social emotional and prosocial education training programs on the quality of inclusive processes (Badia et al., 2020; Cottini 2019; Morganti, 2019; Morganti & Roche 2017). The underlying intention is that this would become a tool

used daily by teachers, able to facilitate the implementation of policies and practices steered towards the promotion of the quality of Italian schools from an inclusive standpoint.

The collected sound evidence plays a fundamental role in working towards the improvement of inclusion inside and outside school. The Scale also serves as an important aid in the process of self-assessment regarding one's own daily practices, particularly with reference to those concerning the didactic methodology used, and the structuring of learning time and space and/or teamwork between teachers. Data showed indeed a worrying situation, whose main critical issues are: a difficult external communication that, in turns, hinders the involvement of other players – both institutional and belonging to civil society-in school activities, curricula development and other activities aimed at inclusion, and in the matching of curricular and support activities in school.

EBE-EUSMOSI project results show that schools rarely promote debates with the community on the topic of inclusion and rarely organize refreshing training activities and courses concerning inclusive education in collaboration with professionals who take care for children with special educational needs. Initiatives involving families and aimed at making the inclusive dimension appreciated are rarely as well.

The results gained from previous research, together with a more recent literature review on the schoolwide approach to the assessment of inclusive education in Europe (Marsili et al., in press) clearly highlight the need for setting common assessment criteria and indicators for school inclusion, with the aim of building an efficient collaboration at all levels of the educational system (politics, leadership and end users). This is the goal of an innovative European research project called Algorithm for New Ecological Approaches to Inclusion (ECO-IN)[5]. The project aims at investigating the right courses of action to improve the quality of school inclusion through a vision that is open to the territory, contemplating how the involvement of all the players and resources in the context where the school is located can be a determining factor. In other words, how to set a real policy of inclusion in Italy and Europe? For this end, we are developing an innovative, digitalized and multi-language system, based on a specific, reliable and valid algorithm-based scoring system for new ecological approaches on inclusion and for assessing and monitoring the processes of inclusive education carried out by the different target groups.

Recently, some assessment tools have been produced (Schurig et al., 2020) outlining the importance of the ecological and bio-ecological systems theories (Bronfenbrenner, 1976, Bronfenbrenner & Morris, 2007) with the aim of helping understand the relationship between the factors and players that impact inclusive education.

Notwithstanding such encouraging signals, national and international studies about the responsibilities of the many players involved in inclusive education (teachers, school heads, collaborators, psychologists, policymakers, etc.) are still very limited. What is clearly lacking is a shared vision, with clear objectives to foster inclusion, that with engage all and that would allow, in addition, a continual exchange between social and educational inclusion. We hope for an increasing engagement of the different play-

ers, especially at national level, in the monitoring, in the data collection, in the training processes and in the implementation of inclusive educational policies and practices.

Conclusions

Italian's school system has gone through many changes and shifts in pursuing of a fully inclusive system.

50 years of history in this sense – an educational – instructional as well as a legislative one – bear quite a testimony of this long journey.

However, for as many efforts have been made and still are, and inasmuch as these efforts show a willingness of improvement, there are gaps that should be filled.

One surely is the "double speed" of the legislative course and the actual school life and teachers' training, readiness and understanding of inclusion. While there are strives to align with the international legislative provisions to broadening and modernizing the concept of inclusive education, the educational reality seems to have come to a standstill, in what looks like a sclerotization of attitudes, beliefs and practices. This is what Ianes and Dell' Anna (2020) defined as the risks caused by a self-referential attitude that seems to saturate the Italian school system.

This criticality is not helped by the paucity of research and by various structural and organizational problems faced by schools both in their physical and philosophical environments.

In this paper we have provided a concise frame for what means to be inclusive in the Italian school system, putting together both the good practices and the shortcomings.

As all structures that have been standing and changing for such a long time, the Italian school system as well needs to be reviewed and revised in the light of global changes in terms of new approaches to teaching – learning strategies and methodologies and new ways of understanding what being "fully inclusive" means, educationally and socially – and let's not forget that education and society are closely intertwined in a feedback loop that informs and changes either in turns.

What surely emerged is the need for a new approach to research in order to gather data that would either support or push for the change of longstanding assumptions that may not be so scientifically sound – both from a practical – instructional and ethical perspective.

Inclusive education is both a process and a human stance; the Italian example, with its many lights as well as many shadows, can bring much to the international discourse. It just needs to find a new pacing that would keep up with the fast changes and innovations happening worldwide, welcoming them and merging them with what of good has to offer.

Notes

1. *The Personalized Instructional Plan - Piano Didattico Personalizzato (PDP) is a document drafted by the teaching staff (primary school) or by the class board (secondary school) for the organization of the dispensatory devices and the compensatory tools to allow students with SEN a fully inclusive education (D.M July 11th 2011)*
2. *The Individualized Educational Plan-Piano Educativo Individualizzato (PEI) is an annual instructional and educational instrument, which refers to the educational and instructional goal, the tools and strategies to implement for achieving a learning environment able to promote the development of the capacities of students with disabilities and the fulfilling of the identified educational needs (D.M 182, 2020)*
3. *https://www.miur.gov.it/web/guest/-/scuola-on-line-i-dati-sugli-studenti-con-disabilita-riferiti-all-anno-2017-20-1*
4. *https://www.istruzione.it/inclusione-e-nuovo-pei/*
5. *"Algorithm for new Ecological approaches to Inclusion" (ECO-IN) (Ref. 612163- EPP-1-2019-1-IT-EPPKA3-IPI-SOC-IN - EPPKA3) - Support for Policy Reform - Social inclusion in the fields of education and training. For further info please check: https://eco-in.eu*

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ORIGINAL ARTICLE

The Construction of Innovative Education Curriculum System for High School Students: Based on the Practice of "Workshop + Project" Innovative Education Curriculum of Zhengzhou No. 12 Middle School, China

Hongxun Zhang

Zhengzhou No. 12 Middle School, Zhengzhou 450000, Henan, China

***Abstract**: Innovative education is a higher training requirement for education in the period of social transformation. It needs the education to cultivate talents with innovative consciousness and ability for the development of society. High school is critical for facilitating students' innovative consciousness, innovative thinking, and innovative ability development. Aiming at the problems of insufficient resources, fragmentation of education, and simplification of evaluation in the current practice of innovative education, Zhengzhou No.12 Middle School integrates the characteristics of maker education and STEAM education to carry out the top-level selection, training, evaluation, and development of innovative talents. Formed an innovative education curriculum system that takes "Workshop + Project" as the starting point, relies on research learning courses, multi-dimensional evaluation as a guarantee, and integrates classroom teaching, club activities, project research, intellectual property rights, and expert guidance.*

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***Keywords**: Innovative Education, Innovative Courses, High School, "Workshop + Project", Pathway*

***Correspondence to:** Hongxun Zhang, Research Director, Zhengzhou No. 12 Middle School, Zhengzhou, 450000, Henan, China. E-mail: zhx630@139.com*

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THE transformation of the social economy from the traditional industrial economy to the knowledge economy means that innovation, the essential feature of the knowledge economy, appears to be very important. The American Austrian economist Joseph, known as the originator of "innovation theory," first proposed the concept of innovation in the book "The Theory of Economic Development" (Schumpeter, 1934). According to Joseph, the so-called innovation is to "establish a new production function." In other words, a new combination of factors of production and production conditions that have never been used is introduced into the production system. The innovative concept proposed by Joseph mainly focuses on the technical level. However, with the continuous development of the connotation and extension of the concept of innovation, all activities that can improve the efficiency of resource allocation are innovations.

Innovative education is based on constructivist learning theory and multiple intelligence theory, with the fundamental value orientation of cultivating people's innovative spirit and ability. The core is to cultivate students' exploration spirit of "rediscovering" knowledge through various forms of school education, facilitating the comprehensive power of "recombining" knowledge and the creative consciousness and ability to prepare for "first and unprecedented" things.

As an essential component of basic education, high school is critical for students' personality development and awakening innovative consciousness. Supplementing and accumulating innovative knowledge at this stage and stimulating students' innovative and creative thinking is of great significance to cultivating students' creative ability. In terms of high school education, it is essential to build an innovative education curriculum system and develop high-quality, innovative talents under innovative ideas.

In the exploration and practice of innovative education curriculum construction, Zhengzhou No. 12 Middle School used project research as a carrier, with a maker workshop as a position, appointed professional teachers, and compiled professional teaching materials. The teaching materials were included in the class schedule, allowing the workshop to enter the classroom, forming an innovative, maker education training model that integrated classroom teaching, club activities, project research, intellectual property rights, and expert guidance. This has promoted the normalization of high schools to carry out new ideas and new ideas of innovative education and formed the school's innovative education characteristics. In addition, it has become a model for the new curriculum reform in Henan Province. Therefore, we researched the exploration and practice of "Workshop + Project" launched by Zhengzhou No. 12 Middle School to promote the construction of maker education courses.

Maker Education, STEAM Education, and Innovative Education

Maker education is believed to have originated in the Fab Lab (Fabrication Laboratory) initiated by the Center for Bits and Atoms of the Massachusetts Institute of Technology (MIT) in 2001. On this basis, a user-centered application innovation platform has been

built. As a result, the main body of innovation has expanded from the original scientific research and technical personnel to the general public, and the "Maker Culture" has gradually emerged. In 2009, US President Barack Obama published a famous initiative on "A Nation of Makers" at the "Educate to Innovate" conference. This initiative has enabled Maker Education, which has implemented the educational ideals of famous educators such as Piaget, Dewey, and Papert, to attract more and more researchers' attention (Office of the Press Secretary, 2009). Subsequently, the White House also immediately launched the "Maker Education Initiative" (MEI). Vigorously promote the development of maker education in primary and secondary schools and colleges (Kalil, 2015). Maker Education recognizes the value of "learning by doing" based on Dewey's "school is society, education is life" philosophy (Shapiro, 2016). It aims to provide students with a suitable environment, resources, and opportunities for creation, especially with the help of Network technology tools and open source software (such as 3D printers, Arduino, etc.) allow students to cultivate critical thinking and innovative thinking by integrating creative-based learning. Further, improve the quality of education, develop students' self-confidence, creativity, and interest in science, technology, engineering, mathematics, art, etc., and make them effective innovation carriers (Maslyk, 2018).

STEAM education, which originated in the United States, is also widely recognized worldwide for its interdisciplinary, experiential, technical, and collaborative nature. In 2001, Judith Ramaley, Deputy Chairman of the Education and Human Resources Council, National Science Foundation of United States, used the term STEM (an acronym for science, technology, engineering, and mathematics) for the first time in curriculum development. Its purpose is to advocate interdisciplinary science education driven by problem-solving so that those future talents can adapt to the level of globalization of the knowledge economy and the trend of increasing complexity and cooperation (Hallinen, 2020). After decades of development, STEM education is being carried out with different courses or activities in schools of different stages in more countries outside the United States. For example, in 2011, the Ministry of Education, Science, and Technology of South Korea added humanities to the STEM curriculum model and formed the STEAM curriculum model.

It can be seen that maker education and STEAM education are both innovative education. Both are specific methods and approaches to implement innovative education, but there are also some differences. STEAM education is developed around the knowledge and ability of science, technology, engineering, mathematics, and art, focusing on improving students' STEAM literacy, optimizing academic performance, and laying the foundation for the growth of innovative talents (Teng et al., 2019). On the other hand, the proposal of maker education began with the development of the maker movement, aiming to reshape education by applying maker ideas. It emphasizes turning creative ideas into real works through hands-on operation and learning in creation (He, 2016). Compared with STEAM education, maker education is more directly directed to innovative education, with a more explicit purpose and implementation path. Therefore, maker education and STEAM education integration can bring epoch-making changes to

the current comprehensive practical courses and information technology courses in basic education and jointly promote innovative talents (Yang, 2016).

Of course, innovative education is a complex system engineering that requires the coordinated operation of various educational forms. Therefore, in addition to maker education and STEAM education, moral education and traditional culture education are also essential forms and foundations for promoting innovative education.

Problems in the Development of Innovative Education in China

China also regards the development of innovative talents as a new national development strategy in the 21st century. In 2010, the State Council government issued the "Outline of China's Medium and Long-term Educational Reform and Development Plan (2010-2020)", which put forward efforts to train hundreds of millions of high-quality workers, thousands of specialized talents, and a large number of top-notch innovative talents (The Office of the Working Group of the National Medium and Long-term Education Reform and Development Plan Outline, 2010). High school education is a critical period for forming an independent development of a student's personality and has special significance for improving the nation's quality and cultivating innovative talents. The curriculum is the core of school education. Therefore, to develop the curriculum's innovative spirit and practical ability, we must start with curriculum reform.

In 2016, the Chinese government incorporated innovative education and courses into the "Thirteenth Five-Year Plan for Education Informatization." It also requires regions with conditions to actively explore the application of information technology in new education models such as "crowd creation space," interdisciplinary learning (STEAM education), and maker education. We must make efforts to improve students' information literacy, innovation awareness, and innovation ability. Develop digital learning habits and promote the overall development of students. It is necessary to give play to the supporting and leading role of informatization in cultivating high-quality talents in the future (MOE, 2016).

In 2018, the Ministry of Education issued the *High School Curriculum Standards for Various Subjects (2017 Edition)*. STEAM, STEM, and STEM+ education appear in the curriculum standards of multiple related subjects (MOE, 2018). "Technology and Humanities Integration and Innovation Topics" in the optional compulsory module of "High School General Technical Curriculum Standards" under the "Technology and Innovation" module, mention the extensive use of science, technology, engineering, art, mathematics, society (from now on referred to as STEAMNS) and other disciplines Knowledge, methods and skills. It is proposed to carry out problem solving and technological innovation in topic learning or project learning. This module aims to help students form a vision of subject integration to comprehensively use multi-disciplinary knowledge and methods to systematically analyze and solve real-world scientific, technical, and engineering problems (MOE, 2017).

However, in cultivating students' innovative spirit, Chinese high schools face many problems promoting creative education courses. For example, Guo (2000) pointed out that although innovative education in middle school classroom teaching pays attention to process teaching, the guidance of innovative learning methods is insufficient. As a result, no matter in textbook excavation or teacher-student interaction, students' creative thinking cannot be intensely cultivated. Li & Wang (2014) also pointed out that school education tends to rush for quick success and instant profit under the existing examination-oriented education system, obliterating students' creativity.

Specifically, the main problems are as follows:

(i) Insufficient practical resources. Innovative education is different from the usual knowledge understanding education. It must be based on practice, and the biggest problem encountered at the beginning of implementation is precisely the lack of resources such as venues, tools, and equipment.

(ii) Fragmentation of innovative education. Innovative education has been carried out under various names, but the problem of fragmentation is more prominent. There is no unified target design, no comprehensively designed innovative curriculum system, scattered and random, lacking integration and overall design.

(iii) Simplified evaluation of innovation achievements. Evaluation is the driving force for the implementation of innovative education. However, the traditional way of evaluating results is usually to compare the results. This lacks scientific and institutional nature and cannot effectively motivate students to participate in innovative curriculum activities.

Measures to Promote Innovative Education Reforms in High Schools

To solve insufficient resources, fragmented education, and simplified evaluation, Zhengzhou No. 12 Middle School is based on student development. It integrates the characteristics of maker education and STEAM education. We have organized different project research groups according to students' hobbies and expertise to meet the psychological needs of all students for personality development and stimulate students' curiosity and desire for exploration in many ways. At the same time, based on diversified project groups, the school builds practical operation research sites and production spaces to provide a platform for students' practical exploration. After years of practice, a maker education curriculum and practice system of "Workshop + Project" to promote innovative education have been formed, including scene resources, creative courses, and an evaluation system (**Table 1**).

Build Six "Workshop" Platforms that Support the Innovative Curriculum System

Table 1. Evaluation Dimensions and Contents.

Evaluation Dimension	Evaluation Content
Activity Attitude Evaluation	The initiative and enthusiasm of students in research activities can be evaluated by the time, frequency, seriousness, and behavior of students participating in activities. For example, whether students take the initiative to participate in each themed activity, take the initiative to propose ideas and suggestions, carefully observe and think about the problem, actively use their brains, carefully search for relevant materials, complete the study plan on time, not be afraid of difficulties, and insist on completing tasks.
Evaluation of the Spirit of Cooperation	It mainly evaluates the cooperative attitude and behavior of students in participating in group and class activities. Such as whether students actively participate in group activities, take the initiative to help others, seek help from others, listen carefully to classmates' opinions, share results with others, and take the initiative to play their role in the group.
Evaluation of Inquiry Ability	It can be evaluated by students' performance in asking and solving problems and their expression of the inquiry results. For example, whether students dare to ask questions, start to solve the issues, and express their learning results in a unique and novel way, whether they are good at observing and recording, can comprehensively use relevant information, actively adopt a variety of methods, and express their learning process vividly and the result.
Social Practice, Communication Ability Evaluation	It can be evaluated by the students' ability to communicate with others, the skills, and desires of communicating and cooperating with others, and coordinating various relationships.
Evaluation of the Ability to Collect and Process Information	It can be evaluated by the amount, methods, ways, authenticity of students' collection of information, as well as their ability to discern and reflect on the information and to respond.

The school integrates various resources within the school and strives to build a maker workshop of more than 570 square meters. It consists of six parts: information retrieval center, project research and design room, robotics studio, mathematics inquiry laboratory, production space, and science laboratory. Designated teachers are in charge of the Maker Workshop, and regular classes are held to become a paradise for students' innovation and creativity.

• Information Publishing and Retrieval Center

Students need to retrieve information and query materials from the Internet when researching projects. Therefore, the school has set up a search center for the maker workshop, equipped with eight computers to search for information. At the same time, another function of the center is to pay attention to the maker activities carried out by students, publicize the innovative works of students, and promote and publish the information of maker activities on the provincial maker network platform.

• Project Research and Design Office

A total of four platforms are set up in the project research and design room. The first is an innovative learning platform. The school has specially subscribed to "Invention and Creation," "Juvenile Invention and Innovation," "Middle School Technology," and other magazines. Regularly organize students to read, inspire students' innovative thinking, and lay a good foundation of thinking methods for future innovative activities. The second is a scientific discussion platform. After reading and studying, students combine the problems they have discovered to carry out thought storms and scientific discussions. It puts the wings of perseverance in innovative activities. The third is a collaborative design platform. Based on the first two, students begin to design and plan and put their topics into practice. The fourth is the results display platform. Students develop mature results or works, which are displayed and exchanged here, and provide inspiration and ideas for students to carry out scientific and technological innovation activities in the next stage.

- **Production Space**

After studying the student's maker projects, some need to make models or natural objects, and some need hands-on experiments. Therefore, the school is specially equipped with production space, 3D printers, laser cutting machines, digital lathes, and other modern production equipment and tools are all available, creating good conditions for students to practice.

- **Robot Studio**

In robot maker education, we combine robot teaching, practical activities, and educational model research. On the one hand, elective courses and club activities are used for teaching, hands-on practice, and competition activities. On the other hand, a research group was established to research the subject of maker education. Thus, the "education + practice + research" model has beneficially promoted students' creative and practical ability.

- **Mathematics Inquiry Laboratory**

After high school, a solid geometry laboratory was established, and it was mainly to provide students with a broad and free space through the geometry laboratory. Let each student look at the teacher's design, production, observation, and thinking; then imitate and innovate design and production by themselves. It is similar to a physical and chemical experiment to show the spatial relationship of the research problem by hand to establish accurate spatial concepts and good spatial imagination ability under the comparison of three-dimensional graphics and their corresponding models. Finally, it helps students get convenient and quick problem-solving ideas and methods and improve their ability to analyze and solve problems. Thus, in the teaching process, more practical teaching and learning tools were initially formed.

- **Science Laboratory**

The science laboratory integrates the resources of the school's physics, chemistry, and biology laboratories and adds instruments and equipment for students to carry out innovative and practical activities. Students here mainly complete scientific experiments and scientific investigations related to physics, chemistry, and biology. Emphasize what you have learned, and apply the textbook knowledge you have learned to research and practice. The activities that students carry out here are different from the confirmatory experiments specified in the textbook. Most of the experiments here are based on exploratory experiments.

Following Student Research Projects, an Innovative Curriculum System of "Workshop + Project" Has Been Constructed.

Based on the resources of the six "workshops," through theoretical research and domestic and foreign comparative research, it integrates various innovative education elements such as scientific disciplines, general technology, scientific and technological invention, innovative design, maker education, mathematical logic, etc. Then four innovative curriculum systems combining "technology and art" have been constructed.

- **Disciplinary Integration Curriculum Projects**

This kind, of course, is oriented to apply what they have learned to develop students' subject knowledge and improve their ability to find and ask questions. The system offers four curriculum fusion research projects: research learning, general technology development, mathematical inquiry, and physics inquiry. Research-based education emphasizes basic training and focuses on cultivating student's ability to discover problems. The other three projects focus on developing students to combine the courses they have learned, boost hands-on practical knowledge, learn by doing and do while learning.

- **Invention and Creation Course Project**

The invention and creation course is based on the themes of whimsy, exploring science, innovation and creativity, and hands-on production. The course offers robotics and artificial intelligence courses, innovative education, invention and creativity, intellectual property declaration, water science and technology awards, 3D printing, and laser cutting research projects. Such courses are an effective form of STEAM education to promote maker projects.

- **Combination of Technology and Art Projects**

The combination of technology and art promotes the maker education project, which focuses on reflecting the brilliance of technology and the charm of art. Combining the two ingeniously to encourage education makers can cultivate students' practical ability and improve students' artistic taste. The course offers four projects: OM (Olympics of Minds), DI (Destination Imagination), IC (Innovative Design Competition), and Space City Design.

- **Logical Reasoning Project**

Suppose creation is the prominent position of the maker as a supplement and improvement to the cultivation of creativity. In that case, logical reasoning ability is also the students' ability to find problems and create. Therefore, the school has opened linguistic project research to cultivate students' good thinking chain and provide academic support for maker courses.

Establish the Implementation Plan of "Workshop + Project" to Promote Innovative Education Courses

In addition to the construction of venues and resources, how to actively and effectively promote is the critical point of the school. Based on the basic situation of school development, the school has independently developed two textbooks, *Into Research Learning and I Grow with Innovation*. Become a school-based innovative education textbook for students to learn and cultivate students' sense of innovation.

In addition, the school is guided by the cultivation of ability and innovative spirit and progresses step by step per primary, developmental, and specialty goals. And establish three steps (popularity, development, and specialty)[1] to normalize, institutionalize and standardize innovative education.

At the same time, the school included maker education as a characteristic project in the school's three-year development plan and included innovative courses in the curriculum. In the course teaching, the "Research Learning Course Plan and Research Progress Manual" is used as the "homework" to set up full-time teachers for research learning and innovative education. Full-time teachers are responsible for course teaching, management, evaluation, and research to ensure the normal development of maker courses.

In the form of a teaching organization, the school is student-oriented and requires all students to participate. In the first semester of grade 10, research courses are offered. Students learn the basic methods of project research, research procedures, and fundamental theories on choosing research projects. Based on general education training based on research learning, the basic knowledge of various courses of students is closely combined to realize the popularization of innovative classes.

Starting from the next semester of the 10th grade, students will be organized into different project research groups according to their hobbies and expertise. From the invention creative project group, water technology invention creative project group,

OM activity invention creative project group, DI activity invention creative project group, space city design invention creative project group, 3D printing, laser cutting invention creative project group, IC activity invention creative project group, the robot maker research team, and the mathematics exploration project team choose one of the ten projects as their research projects. Three to five people voluntarily combine into groups and complete their research projects in different maker workshops under the guidance of teachers.

The following is an example of the creative education project group curriculum plan, the school's innovative education curriculum promotion plan.

Project purpose: Through innovative education, intellectual property education, enlightenment of thinking, apply what you have learned, creatively solve problems, and cultivate students' practical ability.

Course promotion process:

Section I. Lecture.

Section II. I grow up with innovation courses (The Conjecture of Xiangsha, The Truth About Ghost Face Spider Party), watch the video: My Creative Ideas CCTV "Wonderful Thoughts," "Open Sesame," "Approaching Science."[2]

Section III. Scientific seminars, research topics are determined, and research plans are made.

Section IV. Preliminary design activities.

Section V. Production activity class.

Section VI. Read magazine classes "Invention and Innovation," "Juvenile Invention and Creation," and "Technology for Middle School Students."

Section VII. Research and production activities.

Section VIII. Computer retrieval lesson report.

Section IX. Everyone writes the experience of participating in innovative activities this semester.

Section X. Speech at the Innovation Forum.

Section XI. Appraisal and display of research results, patent application, participation in competitions, etc.

Constructed an Evaluation Strategy for the Implementation Effect of Innovative Courses

The implementation effect of innovative courses needs to be judged through scientific evaluation. At present, curriculum evaluation is based on multiple intelligence theory, focusing on student development and growth in various dimensions (He & Yang, 2017; Huang & Hu, 2003). Therefore, schools need to take student development as the core, design an evaluation system in multiple dimensions, and then periodically analyze and evaluate the implementation of innovative courses and the development of students. Then adjust the course content, improve teaching management and form a mechanism for continuous curriculum innovation. At the same time, various awards are set up, and multiple ways to display results are explored to stimulate students' creative enthusiasm (**Table 2**).

• Scientific Design Evaluation Dimension

Under the guidance of evaluation goals, the practical evaluation must be based on rich evaluation content. Innovative courses take student development as the core and focus on cultivating students' comprehensive abilities. Therefore, the evaluation dimension is also based on the development of students. As a result, the evaluation content is refined; through the process, students' enthusiasm to participate in different stages of the activity is stimulated.

• Set Evaluation Awards

Under the guidance of the evaluation target and combined with the evaluation content, the school has established various awards. The staged chain appraisal method is adopted to mobilize students' enthusiasm to participate in the appraisal and display, thereby making the assessment more humane. The awards are divided into the best combination group, the most creative group, the outstanding research and presentation group, the outstanding research group, the best participation award, and the innovation competition achievement award. Through a variety of trophies, students are encouraged to participate and explore actively.

• Expansion of Ways to Display and Recognize Innovation Achievements

Regarding the achievements of students in innovative projects and research activities, on the one hand, the school commends outstanding research results through the school's "science festival." On the other hand, the school uses various channels to identify its achievements to encourage students' creativity.

(i) Publication in Newspapers and Magazines.

The outstanding research results of the students have been carefully revised and perfected by the instructor and recommended by the instructor for publication in relevant newspapers and magazines.

Table 2. Awards and Assessment Methods.

Award	Assessment Method
The Best Combination Group	At the beginning of the activity, the students were freely divided into groups, filled out relevant forms. Then, each group member introduced the reason for joining the group and jointly formulated the group's goals. After the project activities are over, the "best combination group" will be selected according to the situation of each group.
The Most Creative Group	To mobilize students' enthusiasm to ask questions and cultivate students' ability to observe and propose topics, each group member is required to present a maker research project. Then each group selects a project to participate in the class "The Most Creative Research" competition.
Excellent Research and Display Group	Organize presentations and display them in the last class of the semester. Let the students show their research results in various forms such as slides, models, speeches, and performances. The school organizes relevant teachers and student group leaders to participate in the appraisal and finally selects the "Excellent Research and Display Group."
Outstanding Research Group	The group can identify and explore topics, topics, and issues of its own choice; it can find, select and select relevant information from the media, reference materials, and scientific and technological materials, and form a standardized research report for the group. After the instructor's recommendation, the self-evaluation of the group, and the comprehensive evaluation of the previous period, the excellent research study group of the class, grade, and school will be selected. Commends and rewards according to level, and reports and displays to the teachers and students of the school, and collects excellent research results into a book.
The Best Participation Award	After the project research is over, every student needs to provide a research experience. Therefore, we will compare and display the research experience of each student and select the best participation award.
Innovation Competition Achievement Award	For projects with a specific value and extensive impact, they will be recommended to participate in various national competitions after being guided by the teacher and fully demonstrated. If the standards for intellectual property protection are met, the school will organize students to participate in patent application work and provide financial support. All topics recommended to participate in the competition are awarded as "Innovation Competition Achievement Award." The projects that can be awarded will be commended and rewarded separately by the school.

(ii) Declare Intellectual Property Rights.

For projects with relatively good inventions, innovations, and creativity, the school especially sets up an intellectual property declaration project team to do various tasks such as guidance, communication, novelty search, and declaration.

(iii) Participate in Various Innovation Competitions at All Levels.

The school regularly organizes students from various project groups to participate in multiple competitions at all levels, broadens students' horizons in the activities, stimulates the greater desire for innovation and creativity, and mobilizes students' enthusiasm for learning.

Effect Evaluation and Thinking

Significantly Enhance the Students' Innovative Ability

The students' creative ability has been significantly improved through the practical application of the "Workshop + Project" course. The achievements have been remarkable, and a batch of innovative results has been formed. More than 200 students have won first prizes in multiple national, provincial and municipal innovation design competitions, such as the International Youth Innovation Design Competition, the Asia-Pacific Innovation, and Creativity Competition Beijing Invitational, the World Mind Olympic Innovation Competition China Selection Competition, and the National Linguistics Olympiad. In addition, the research results of 8 students have obtained the patent certificate issued by the State Intellectual Property Office, and many of the research results of the students have been published in the *Da He Daily and Invention and Innovation magazines. Furthermore, a study on Plant Ink* by eight students, including Jiajia Sun, was included and indexed in CNKI.

Promote the Professional Development of Teachers

British curriculum scientist Denis Lawton believes that three factors affect the professional development of teachers: changes in technology, changes in teaching ideas, and changes in teaching content (Lawton, 2012). The practice and application process of the "Workshop + Project" course is also the teacher professional development process. During the implementation of the school-based curriculum, all teachers will learn to learn, learn to practice, learn to think, learn to reflect, learn to innovate to become practical researchers, and promote the professional growth of teachers. With the maturity of the innovative curriculum system, teachers have also achieved fruitful results in professional development.

Hongxun Zhang's research results were published in several journals such as *Comprehensive Practice Activity Research, Invention and Innovation, and Environmental Education*. In addition, Hongxun Zhang published the monograph *I Grow Together with Innovation* and won the first prize in the National Comprehensive Practice Activity Quality Class Competition, which influenced and led a group of teachers to participate. Hongxun Zhang was also invited to report on the "National Training Program Teacher Training Class" undertaken by the School of Physics and Optoelectronics of Henan Normal University in 2014, 2015, 2016, and 2017.

Promoted the Deepening of School Curriculum Reform

A school-based curriculum is a school-based curriculum formed by all teachers and students based on its own "individual" development needs under the basic premise of ensuring the overall quality of national education. The "Workshop + Project" course combines innovative education courses with regular subject courses and comprehensive

practical activities. Arrange creative education courses into the class schedule so that innovative education courses will be implemented as usual. It stimulated the school's curriculum vitality, innovated the school's curriculum structure, formed a new curriculum culture, and promoted school curriculum reform.

Strengthen the School's Characteristics and Improve the School's Teaching Efficiency

The "Workshop + Project" school-based curriculum has made a distinctive mark for the school. The school's comprehensive school-running benefits continue to show up, forming a certain degree of influence in society. It has been reported by nearly 100 media such as *the Chinese Journal of Education, Basic Education Reference, Da He Daily, Zhengzhou Daily*, and Zhengzhou TV Station. In 2017, the school successively won a series of honorary titles such as the National Pilot School of Intellectual Property Education for Primary and Secondary Schools, the 3D Printing Demonstration Base of the University of Science and Technology of China, the first advanced research learning school in Zhengzhou, and the Zhengzhou Maker Education Demonstration School.

At the same time, due to the school's distinctive characteristics and significant practical effects, it has formed a greater influence and demonstration effect in the city and even in the province. It has been successfully adopted by Zhengzhou No. 7 Middle School, No. 31 Middle School, and No. 47 Middle School, and has produced noticeable results in these practice test units. In addition, the critical teacher training conferences and technical design and innovation seminars of Henan Province's comprehensive practical activities were held in our school.

Notes

1. *Specialty training purpose: Take specialty development and focus on cultivating those with innovative potential and intense interest.*
2. *"Wonderful Thoughts," "Open Sesame," and "Get Closer to Science" are all popular science TV programs launched by China Central Television. The first two are popular science programs for children established for 7-14 years old students.*

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REVIEW

A Review of the Development of the Integration Strategy of Information Technology and Education in the Four Countries of the United States, Britain, China, and Singapore

Jincheng Wang

Epson (China) Co. Ltd, No.81, Beijing 100025, China

***Abstract**: Information technology has a revolutionary impact on the development of education. Therefore, it is a strategic choice to comprehensively respond to educational development challenges in the information age to promote the modernization of education with education informatization. Countries worldwide have begun to attach importance to the development of educational information technology and have successively formulated a series of policies and plan to guide its development. At the same time, implementing a number of measures has dramatically promoted the realization of educational information technology development goals. Taking the United States, Britain, China, and Singapore as examples, we reviewed the promotion strategies of global education informatization and summarized its typical characteristics and development trends based on an overview of the development routes of various countries.*

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Correspondence to: *Jincheng Wang, Epson (China) Co. Ltd, No.81, Jianguo Road, Chaoyang District, Beijing 100025, China. E-mail: wang.jincheng@ecc.epson.com.cn*

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Introduction

THE term "informatization" first appeared in some academic documents in Japan in the 1960s. At that time, the concept of "informatization" was mainly elaborated and defined from an industrial perspective. In the 1970s, Germany, the European Union, and UNESCO issued a series of plans to promote the application and development of information technology in society. These plans all regard information infrastructure as an essential part.

In September 1993, the Clinton administration of the United States formally proposed the construction of the "National Information Infrastructure" (NII), commonly known as the "Information Superhighway" plan. The core is to develop a comprehensive information service system centered on the Internet and promote the broad application of Information Technology (I.T.) in various fields (Clinton White House, 1993). Driven by this, many developed and developing countries have successfully issued a series of national information infrastructure construction plans, leading to a wave of global informatization construction.

The concept of education informatization was put forward with the construction of the information superhighway in the 1990s. In the U.S. "Information Superhighway" plan, the application of I.T. in education is mainly regarded as an important way to implement educational reforms oriented to the 21st century. This move by the United States has aroused positive reactions from all countries in the world. Developed countries represented by Britain and Singapore have successively formulated plans to promote the application of I.T. in education in their countries. In addition, developing countries represented by China have also begun to pay attention to education informatization and gradually incorporate education informatization into their national development strategies.

With the rapid development and innovation of information technology and its continuous penetration into education, the importance of education informatization in education reform and development has become increasingly prominent. Governments of various countries have successively formulated strategic plans at the national level to guide the development direction of education informatization. At the same time, a series of measures have been taken to promote the concrete implementation of education informatization policies, which in turn fosters education reform and innovation. The policy of educational informatization embodies the overall thinking and basic direction of the country's development of educational informatization. It has a macro-planning and guiding role for its construction and development and is an essential guarantee for the effective development of educational information technology activities.

This article selects the United States, Britain, and Singapore as developed countries, and China as a developing country, and summarizes the development of education informatization in the four countries. First, outline the three stages of the development of global education informatization and then research the promotion path of international education informatization policy. It is helpful to deeply understand the current situation and product rules of education informatization in developed and devel-

oping countries to provide a valuable reference for the in-depth promotion of the development of global education information.

Global Educational Information Technology Development Process

The accelerated development of modern information technology in the 1990s promoted education informatization in all countries worldwide. As an actual content and indicator of cross-century education reform, the education informatization has been included in the new round of education reform plans worldwide. Various policy plans have been issued one after another. Under the guidance of the policy, a phased and gradual strategy has been adopted to promote the development of educational information. Due to the differences in economic and social development, the stages of educational informatization development in different countries in the same period are different. To meet the needs of different stages of development, the focus of education information policies formulated by various countries will continue to evolve and change. But on the whole, its strategic development route has major phase characteristics. It can be divided into the following three stages:

Information Infrastructure Comprehensive Construction Stage

Education informatization includes many aspects, including infrastructure construction, information resource construction, teacher informatization training, and policies and regulations. Infrastructure construction refers to constructing campus networks, multimedia classrooms, learning terminals, and other hardware environments. The primary content of educational information is infrastructure construction (Jiao et al., 2014), which plays an essential supporting role in developing and applying educational information.

In September 1993, the United States proposed the National Information Infrastructure (NII) strategy, aiming to build a highway in the information age based on the Internet. In the "National Educational Technology Action Plan" promulgated in early 1996, it is clearly stated that each classroom needs to have a computer that can connect to the Internet, high-quality learning software, and well-trained teachers (NETP1996) (U.S. Office of Educational Technology, 1996). In 1998, the U.S. government invested 51 billion U.S. dollars in enabling every U.S. citizen to use information technology for lifelong learning. The survey showed that in 1994, only 3% of schools in the United States were connected to the Internet; in 1996, 4% of schools could meet the requirement of 1 computer for every five students, and 9% of classrooms could be connected to the Internet (Glennan & Melmed, 1996); In 1999, this figure had reached 63%; in 2000, it was refreshed to more than 90%.

Britain also pays special attention to the development of information infrastructure in ICT education. At this stage, the government vigorously supports the construction of educational information infrastructure from policies and funds. In 1998, the British government promulgated "Our Information Age" demanding that the government reform education, use new technologies in education, and use the government's investment in education funds. As a result, a total of 6% of education funds were used for school hardware purchases, ensuring that 20% of Britain's elementary and middle schools could connect to the Internet. This policy directly promoted the large-scale construction of Britain's educational infrastructure. According to the statistics provided by Ofsted in 2004, the proportion of schools with digital projectors nationwide was 80% for elementary schools and 99% for middle schools (Ofsted, 2004).

Singapore is one of the earliest countries in the development of global education information. In 1997, the Ministry of Education promulgated a five-year basic education informatization development plan-Masterplan 1 (MP1). The implementation of MP1 has laid a solid foundation for integrating information technology and curriculum in schools. In particular, it has played a significant role in providing Information Communications Technology (ICT) infrastructure and enabling teachers to have a basic level of ICT integration capabilities. The implementation of MP1 has achieved good results. By the end of MP1, all schools were equipped with ICT infrastructure to support teaching, connected to the Internet, and directly accessed the Ministry of Education website. The student-to-computer ratio in elementary schools was 6.6:1, and in middle schools was 5:1 (Lyu, 2016).

China's education informatization construction is a little later than that of developed countries. In 1998, the Ministry of Education formulated the "Action Plan for the Promotion of Education in the 21st Century". It implemented the modern distance education project (MOE, 1998). In 1999, the Central Government and the State Council issued the "Decision on Deepening Education Reform and Comprehensively Promoting Quality Education," which clearly stated that "we must vigorously improve the modernization of educational technology and the level of educational informatization" (Government of the People's Republic of China, 1999). In 2000, the Ministry of Education issued the "Notice on the Implementation of the School-to-School Connection Project in Primary and Secondary Schools," which became the first national development plan in education informatization in China (Ministry of Education of China, 2002). In 2001, the State Council issued the "Decision on the Reform and Development of Basic Education" (No. Guo Fa [2012]), which began to pay attention to information construction in rural areas and other areas with weak education, and in 2003 began to implement the modern distance education project for rural primary and secondary schools (Government of the People's Republic of China, 2001). This series of policies paved the way for the construction of educational information technology.

Since 2000, China Education Satellite Broadband Multimedia Transmission Network (CEB-sat) and China Education and Research Computer Network (CERNET) have been established one after another. As a result, the rate of access to the Internet and China's educational satellite broadband has increased substantially in schools at all

levels. In 2012, to meet the needs of the development of education in the new era, the "Three Links and Two Platforms"[1] construction plan was put on the agenda and was widely carried out nationwide (Zhang, 2019).

As the first step in advancing educational information, the main task is to achieve the initial coverage of educational networks and campus networks and form a digital resource service system. In terms of a specific time, most information infrastructure construction in developed countries such as the United States, Britain, and Singapore began in the 1990s. The complete construction of the infrastructure was completed at the beginning of the 21st century. Due to different levels of development, developing countries represented by China started relatively late (most of them started in the early 21st century), but from the perspective of the development stage, the first stage of their development was led by the complete construction of information infrastructure.

Popularization and Application Stage

With the overall advancement of infrastructure construction, applying information technology to education has become the focus of attention of all countries. Especially in the case of a mismatch between technical literacy and facility building, popularizing the application of information technology in education is the focus of this stage.

U.S. information infrastructure construction has made remarkable achievements in the first phase. On the contrary, it is the challenge of the low technical literacy of the whole people. Schools in most areas do not use information technology for teaching (Zhu et al., 2014).

In this context, the U.S. government has successively issued national education technology plans, which involve infrastructure construction, information resource construction, and teacher information literacy. Starting from the second plan launched in 2000, the program's focus shifted to improving teachers' information literacy. At the same time, the promulgation of the *No Child Left Behind Act* of 2001 once again emphasized that we must not only invest in hardware construction but also strengthen teacher training and integrate infrastructure construction and applications. Therefore, in the third national educational technology plan, seven action plans are proposed: strengthen leadership; consider reform budgets; improve teacher training; support digital learning and virtual schools; encourage the use of broadband networks; move toward digital content; establish integrated information system (U.S. Department of Education, Office of Educational Technology, 2004). In the development plan of NETP2000 and NETP2004, the United States focuses on promoting digital resources and professional development of teachers, paying attention to the construction of digital resources that meet the individualized learning of students, and improving teaching applications through teacher training.

In the first phase of Singapore's 1997 development plan MP1, they were promoting the promotion of teachers, and students' information literacy has been listed as one of the goals. Therefore, after completing the first phase of the plan, the information literacy of teachers and students has been dramatically improved: teachers have mas-

tered the essential ability of information technology and curriculum integration, and students have acquired the necessary skills to complete ICT-based projects or tasks. Based on the first phase of the plan, in 2003, the Ministry of Education of Singapore launched the second phase of the 5-year basic education informatization development plan-Masterplan 2 (MP2). Compared with MP1, which focused on school information technology infrastructure construction, MP2 concentrated on the deeper application of information technology in education (Lyu, 2016). In 2005, Singapore implemented the I.T. Demonstration School Project. The project selected 15% of schools as pilot projects, encouraged them to apply information technology in teaching, formed a typical information technology teaching application model, and actively promoted it nationwide.

The same was true in Britain. The information strategy of *Harnessing Technology: Transforming Learning and Children's Services* was released in 2005. It proposed to make full use of ICT technology in various fields of education and children's services to provide complete service environment support for learners' personalized learning. *Harnessing Technology: Next Generation Learning*, which started in 2008, more clearly proposed to use ICT to provide learners with learning tools, online support, customizable resources, and technical guidance to promote learners' personalized learning (Becta, 2008; Laurillard, 2005).

After the first phase of comprehensive information infrastructure deployment, China quickly shifted the construction task to application popularization. In March 2012, the Ministry of Education issued the "*Ten-Year Development Plan for Education Informatization (2011-2020)*" (hereinafter referred to as the "*Ten-Year Plan*"). As a result, the overall design and nationwide deployment of education informatization work for the next ten years has been carried out from the national level-China's first long-term strategic plan for education information (MOE, 2013).

The "*Ten-Year Plan*" proposed to make education informatization a strategic focus and priority area for national information development. By 2020, an information-based learning environment in which everyone can enjoy high-quality educational resources will be established, an information-based support service system for a learning society will be formed, and the broadband network of all regions and schools at all levels will be formed fully covered. In addition, education management information will be achieved. As a result, the level of integration and development of information technology and education has improved significantly. In May 2015, China's first International Education Informatization Conference was held in Qingdao, Shandong. In the meeting, the goal of "building a networked, digitized, individualized, and lifelong education system" was set up. Building a learning society where everyone learns, can learn everywhere, and can learn at all times. Cultivate a large number of innovative talents." It is pointed out that it is necessary to "expand the coverage of high-quality educational resources employing informatization" and promote educational equity through educational informatization (Li & Lyu, 2015). In June 2016, the Ministry of Education issued the "Thirteenth Five-Year Plan for Education Informatization." It mainly embodies three concepts: the first was from construction to application, the second was from a single point to the overall situation, and the third was from a line to integration (MOE,

2016). The official release of the "*Ten Year Plan*" and the convening of the first national education informatization conference have enabled China's education informatization work to develop rapidly. Data showed that in 2015, the school's online teaching environment dramatically improved. The Internet access rate of elementary and middle schools in China was 83%. The penetration rate of multimedia classrooms was 73%; high-quality digital education resources were becoming more abundant, and information-based teaching was becoming more popular (Zhao, 2015).

At this stage, digital education resources are widely shared, and information technology is commonly used in education and teaching. In this process, paying attention to educators' information literacy and building extensive and rich digital education resources have become the strategic priorities of all countries. However, the focus of construction differs between countries. For example, Singapore assigns a "people-oriented" value to technology and focuses on cultivating digital learners. On the other hand, the United States believes that teachers are operators who truly integrate information technology and education, and therefore pay more attention to the professional training of teacher information.

Integration and Innovation Stage

After the first two rounds of development, the level of education informatization in various countries has been improved to a certain extent. However, different countries have put forward new requirements for students' knowledge and ability structure to encourage students to adapt to the information age. Therefore, various countries have gradually shifted their development focus from hardware facilities to information technology to promote education reform and innovation and teach to cultivate innovative talents that meet social development needs.

First of all, in the United States, although the level of educational information in the United States has improved significantly after more than ten years of development, the two problems of the low graduation rate of college students and significant differences in academic achievement between students have not been resolved. To solve these two problems, in 2009, former U.S. President Barack Obama put forward the goal of "the graduation rate of American colleges and universities should regain the leading position in the world by 2020." And in 2010, *The National Education Technology Plan, Transforming American Education: Learning Powered by Technology* (U.S. Department of Education, Office of Education Technology, 2010), was promulgated. The plan put forward goals and suggestions in five areas: learning, evaluation, teaching, infrastructure, and productivity, and hope to build a lifelong learning system that continues to develop through technology. In November 2015, the Office of Educational Technology of the U.S. Department of Education issued the fifth "U.S. Educational Technology Plan"-*Future Ready Learning: Reimagining the Role of Technology in Education* (NETP2016). The plan re-examined the role of technological change learning, aimed to narrow the long-standing gap in fairness and accessibility through changes in learning

methods and experiences, and created conditions for the development of all learners (U.S. Department of Education, Office of Education Technology, 2015).

Britain's educational informatization development has always had its characteristics. After going through the stage of popularization and application, such as infrastructure construction and ICT course construction, Britain began to focus on cultivating students' innovative qualities. In March 2016, Britain released the *DfE Strategy 2015 to 2020: World-Class Education and Care*. They formulated the education development strategy and plan for the next five years. They proposed vigorously promoting the opening rate of STEM courses and improving the quality of related classes (U.K. Department for Education, 2016).

The same is true in Singapore. To further promote the development of education informatization, the Ministry of Education of Singapore formulated the three-phase development plan for basic education informatization-Masterplan 3 (MP3) in 2009. Based on continuing to advance the vision of MP1 and MP2, MP3 further promotes the application of ICT in the teaching process, thereby cultivating students' collaborative learning and autonomous learning capabilities (Lyu, 2016). In 2015, the Ministry of Education of Singapore formulated the fourth basic education informatization development plan – Masterplan 4 (MP4) (Lyu, 2016). MP4 broadens the focus of attention throughout the course. It not only focuses on independent learning and collaborative learning but also focuses on quality learning and cultivates future-oriented and responsible digital learners and citizens. In the MP4 strategy, ICT is continuously integrated into courses, teaching methods, subject evaluation, and learning resources so that technology can be better integrated into the learning field. At the same time, MP4 adopts a more systematic assessment of various ICT capacities building work and emphasizes the social transformation of research.

After the 1.0 stage of education informatization characterized by "infrastructure + equipment supporting + application exploration," China's education informatization has entered the 2.0 stage. Education informatization 2.0 is to open a new era of integrated innovation and intelligent leadership based on the "three links and two platforms" of the 1.0 stage. In April 2018, the Ministry of Education of China issued the *Education Informatization 2.0 Action Plan*, which proposed to achieve the development goal of "*Three Completions, Two Improvements and One Big Platform*" by 2022. That is, the teaching application covers all teachers; the learning application covers all school-age students; the construction of digital campus covers all schools; the level of information application is improved; the information literacy of teachers and students is improved, and a large "Internet + education" platform is built. Furthermore, to create a new model of talent training under the conditions of "Internet +," develop a new model of Internet-based education services and explore a new model of education governance in the information age (MOE, 2018).

As the third stage of the development of education informatization, all countries have placed innovation and integration in a strategic position. At this stage, the close integration of information technology and education has become the theme of development. The cultivation of students' future-oriented quality is highly valued. In

addition to the quality of informatization teaching, humanistic care has become a new trend of development.

The Promotion Path of Education Informatization in Various Countries

The four countries have also achieved impressive results in facility construction, resource development, team training, and application enhancement from a horizontal perspective. This has provided strong support for the reform of teaching and laid a foundation for reshaping educational forms. Although the educational reform tasks faced by various countries in different historical stages are different, the policies implemented are also other in connotation and extension. However, from the perspective of the deepening of education reform and facing the challenges of human society in the 21st century, there are some commonalities. These commonalities are embodied in the characteristics and measures presented in educational information technology construction in various countries worldwide.

Pay Attention to Infrastructure Construction and Application

The construction of educational informatization infrastructure was the foundation for the development of educational informatization and a prerequisite for supporting the development of educational informatization (Liu et al., 2013). Therefore, in the education informatization strategic plans formulated at different stages of development, all countries attached great importance to the construction of infrastructure. Moreover, with the continuous development and advancement of technology, countries' goals for infrastructure construction were also constantly improving.

From the explanation in the second part of this article, it can also be seen that all countries have put education infrastructure construction first. Under the operational guidance of the government, countries continue to increase investment in the construction of information infrastructure. According to statistics from the U.S. White House, from 2013 to 2015, even in the mid-term of the development of information technology, the U.S. investment in information infrastructure continued to grow. In 2015, only $4.7 USD billion was invested in purchasing high-speed networks and personal ICT equipment. In Britain, the investment and construction of ICT infrastructure is also the main content of the government's attention. Britain added 160 million pounds to the 2012 science and education budget to construct information infrastructure to help universities share massive research data more efficiently. In January 2016, the Minister of Education Nicky Morgan announced that the British government would invest 130 million pounds in improving the current network infrastructure, aiming to provide all students with an online learning environment anytime and anywhere (Community Editorial Team at Comcast Business, 2017; Matthews, 2013; Morgan, 2016).

From the perspective of the specific content of the construction, due to the different national conditions and educational status quo, there are also distinct differences among countries. China emphasized the overall improvement of the allocation level of school campus networks, multimedia classrooms, and subject teaching resource tools and promoted the sharing of high-quality digital education resources. The United States not only regarded computers and the Internet as an essential part of infrastructure construction but also regarded personnel and learning resources as part of comprehensive learning infrastructure. Singapore emphasizes the student-to-computer ratio, teacher-to-computer ratio, and Internet coverage (Zhu et al., 2014).

Attach Importance to Digital Education Resource Services

In addition to infrastructure construction, the advancement of education informatization is inseparable from the development and application of digital education resources. Therefore, at the same time as infrastructure construction, the four countries have gradually formed a mechanism for the service and operation of digital education resources from construction, application to evaluation after long-term development (Sun & Liu, 2016).

In Britain's educational information development process, a notable feature is the construction of educational resources. Based on ensuring infrastructure construction, Britain puts resource construction in a strategic position for its development. It provides strong support from the capital to the workforce to ensure the smooth development of its basic education informatization. The Britain National Learning Network, launched in January 1998, is an online education resource channel provided by the British government. It is also a significant information highway education channel. It makes full use of the network to connect schools, research institutions, and libraries to establish a unified education network and education services. It is a national information network system for developing and applying online learning, teaching, and public services. Britain's national learning network is rich in teaching resources, including teacher training, education research, teacher professional development, education consulting, education supervision, library, employment consulting and training, vocational education, education management, and other extensive information resource columns. Currently, Britain's National Learning Network has become the most comprehensive education portal in Europe. It has a robust search function, with a total of about 250,000 index pages. What's more noteworthy is that its resources are still developing, and new websites are still being added. It will create an increasingly rich and diversified resource environment for Britain education.

Although the United States was not a pioneer in constructing digital resources, it had a far-reaching influence on digital education resources. In April 2001, the Massachusetts Institute of Technology in the United States began to implement OpenCourseWare (OCW) with the core concept of co-construction and sharing of educational resources and freely open the teaching materials created by the school. In 2003,

the OCW website was officially launched. Under the permission of free re-use, learners can use the MIT courses freely and openly through the website, including syllabus, lecture notes, assignments, and core teaching materials for examinations. At present, OCW has released more than 2,500 MIT courses, attracting more than 200 million learners from all over the world and inspiring the global open learning movement. Thus, the world connects users worldwide through information technology to acquire cutting-edge knowledge (OpenCourseWare, 2021).

Driven by OCW and the Open Educational Resource Movement, in 2012, a new type of open education model, Massive Open Online Courses (MOOCs), was born. As soon as MOOCs were proposed, they were highly praised by users all over the world. Typical MOOCs platforms include Coursera, Udacity, and edX. There are thousands of online courses open on these platforms, with millions of learner users. They set up course types according to different majors and certify students' course learning in credits and certificates. Driven by world-renowned universities and commercial capital, the rapid rise of MOOCs worldwide has promoted globalization, democratization, and fairness of higher education (Pappano, 2012).

The construction of educational resources in China started relatively late. In 2003, the Ministry of Education of China proposed establishing the school, provincial, and national three-level quality courses in various disciplines and majors. It aims to provide learners with a curriculum resource system that supports lifelong learning (MOE, 2003). In 2012, it proposed to build a public service platform for educational resources, aiming to realize the co-construction and sharing of resources (Hao & Xiong, 2012). In 2014, "*One Teacher, One Excellent Class; One Class, One Master Teacher*" was launched. As of July 2021, the platform has received 16.97 million lessons from teachers across the country (MOE, 2021). In addition, as MOOCs entered the Chinese education vision in 2013, China's online open courses have developed rapidly. Currently, there are hundreds of platforms related to MOOCs. For example, platforms such as NetEase Cloud Classroom, School Online, China University MOOC, and Chinese MOOC have been launched one after another, gathering a wealth of learning resources and a large number of learners. As of the end of January 2020, there were 3,166 courses taught on the MOOC platform of Chinese universities alone (China University MOOC, 2021).

Using Technology as a Means to Realize the Reform of Teaching and Learning

The core goal of the development and practice of educational informatization is to promote the transformation of learning and teaching, which is fully reflected in the change of learning and teaching methods by information technology.

To improve the quality and efficiency of student learning and realize the full development of individual students, various countries have put forward new requirements on student learning methods and learning support systems. For example, the United States NETP2010 put forward the "21st-century learning model supported by

technology", emphasizing the use of ICT to create a learning atmosphere, provide practical tools and enrich learning resources so that learners can entirely freely choose learning methods. NETP2016 was based on the fundamental goal of cultivating participatory and autonomous learning supported by ICT. It designed a "learning framework that is ready for the future" and emphasized creating a ubiquitous learning environment to form new participatory learning and autonomous learning supported by information technology.

Britain released its *Harnessing Technology: Transforming Learning and Children's Services* strategy in 2005. It proposed using ICT to carry out a comprehensive educational information transformation to promote teaching reforms and provide teaching environment support for personalized learning students. The "*Next-Generation Learning*" movement that began in 2008 also clearly proposed using ICT to provide learners with learning tools, online support, customizable resources, and technical guidance to promote learners' personalized learning (Becta, 2008). In the *DfE Strategy 2015 to 2020: World-Class Education and Care* released in 2016, the principle of "children and young people first" was clearly defined. It emphasized that "quality everywhere" education should be learner-centered, and the student-centered education model would continue to be deepened and implemented (U.K. Department for Education, 2016).

Singapore had popularized a new teaching model in which teachers used information technology to create a student-centered learning environment in MP2. MP3 emphasized that teachers design learning content in an information environment promote students' independent and collaborative learning. MP4 required teachers to become the designers of student learning experience and background in the information technology environment and provided ubiquitous and personalized teaching (Tang et al., 2016).

The relevant texts of China's education information policy also emphasize promoting the integrated development of information technology and education. Expand from serving teaching to serving educating people, and build new learner-centered education ecology. It can be seen that the use of information technology to transform learning and teaching methods and to innovate curriculum content and teaching methods has become the consensus of the promotion of educational information technology in China and abroad.

Pay Attention to the Professional Development of Teachers

The four countries have put forward new teachers' abilities and roles to promote information technology and curriculum integration. *New Media Consortium Horizon Report: 2014 Basic Education Edition* pointed out that "reshaping the role of teachers" is a crucial factor in applying educational technology in schools in the next one to two years (Johnson et al., 2014). With the rapid development of information technology and its gradual application in education and teaching, teachers were expected to be able to skillfully use information technology and other methods to improve their work, such as

the delivery of teaching content, the evaluation of students' academic performance, the cooperation between teachers, and the daily work of the school. Therefore, training teachers' professional skills, especially applying information technology, was a meaningful way to promote capacity development.

Since NETP1996, the United States has paid attention to teachers' ICT application capacity building. NETP2000 proposed that all teachers should have the ability to use technology to promote students' high-level learning effectively. Each subsequent plan emphasized the requirements and cultivation of teachers' ICT application ability. In NETP2016-2017, based on emphasizing the increase of teachers' connection ability, the provision of changing the role of teachers was put forward. It clarified that teachers should be the guide, facilitators, motivators, and co-learner of student learning. Schools and specialized institutions should provide teachers with continuous and timely support and guarantee information technology capacity training, professional development, and informal collaboration.

In 1997, the British government established the Virtual Teacher Center (VTC) website. It provided teachers with a large number of online resources and trains teachers on the skills, knowledge, and concepts of information technology teaching (Jung, 2005). The American Educational Resources Portal (GEM) provided teachers with specific software and resource training to encourage them to make full use of digital education resources to help to teach (Jobe, 2010). In addition, by setting up awards for teachers, teachers are encouraged to use digital resources in teaching. For example, the British government has specially set up the *British Educational Training and Technology Show* to promote teachers' digital education resources. In 1998, the Initial Teacher Training National Curriculum in ICT Use in Subject Teaching was promulgated. It put forward requirements for teachers' ICT skills. In 2004, the Secretary of State for Education and Skills of Britain launched a hands-on support project to improve teachers' ability to integrate ICT and teaching (BETT, 2021; Rizza, 2011; Secretary of State for Education and Skills, 2004).

Singapore has emphasized the training of teachers' ICT skills from MP1 and clearly stated that teachers should have the ability to integrate ICT and curriculum and teach informatization. Both MP2 and MP3 continued and strengthened this requirement. MP4 required teachers to become designers of students' learning experience and environment based on the role of learning partners.

In China, the construction and development of the teaching staff have been the critical content of the education information policy since 2010. Teachers' informatization training and development measures were also abundant. Such as implementing the teacher information technology application ability improvement project, the formulation and improvement of teacher education technology ability training curriculum standards, and the organization of "*One Teacher, One Excellent Class; One Class, One Master Teacher " activities, etc. The "Education Informationization 2.0 Action Plan*" launched the "Artificial Intelligence +" teacher team building activities, and the "*Opinions on the Implementation of the National Elementary and Middle School Teachers' Information Technology Application Ability Improvement Project 2.0"*

officially launched the *Information Technology Application Ability Improvement Project 2.0*. It promoted teachers to actively adapt to new technological changes such as informatization and artificial intelligence and actively and effectively carry out education and teaching in the intelligent era (Wang, 2019).

Conclusions and Perspective

While implementing educational informatization in the four countries, we can see some trends in the development of global education informatization, try to outline these trends, and summarize the characteristics of global education informatization in the emerging stage.

Four Countries Have Put the Development of Education Informatization in a Strategic Position

Since the 21st century, governments worldwide have regarded the priority development of educational information as an essential factor related to their country's international competitiveness and development prospects in the 21st century. Accordingly, they have formulated education informatization policies and adopted a series of actions. To ensure national education informatization planning continuity, governments worldwide attach importance to top-level design and solve practical problems faced by education informatization in a phased and progressive manner.

Corresponding to this is the information industry. Judging from the development experience of various countries, enterprises in the information industry field have played a positive role in the development of education informatization in multiple countries. The construction of educational informatization infrastructure, innovative software and hardware research and development, and the research on core technologies of educational informatization have all been supported by related enterprises in the information industry.

With the rapid development of the current information industry, the demand in the education information field presents diversified characteristics. Therefore, to ensure that education-oriented enterprises can support the development of this field for a long time, governments of various countries have also given corresponding designs in terms of policies and investment models, which are conducive to its sustainable development.

The Development of Education Informatization Has Promoted the Innovation of Education

Promoting educational reform is the value orientation of global education informatization; that is, the fundamental purpose of educational informatization is to promote the overall reform of education so that education can meet the requirements of the information age for talent training goals, training models, educational organization management models, and service models. In the infrastructure construction stage, the

rapid development of information technology has promoted the emergence of various innovative products and changes in application methods, bringing new technologies and concepts into classroom teaching. The introduction of new technologies such as cloud computing, 3D printing, wearable, augmented reality, games, and gamification into the classroom has wholly affected students' learning styles and teachers' teaching styles. Open concepts such as available courses, open data, open resources, open education, open access, and open thinking have real value in applying information technology in education. In addition, social networks and social media are changing the way people live and communicate, as well as the form of knowledge acquisition.

In addition, with the rapid development of makerspace, wearable technology, adaptive learning technology, etc., and their widespread application in education, future educational trends such as blended learning, open educational resources, and inter-school cooperation have become increasingly prominent. More and more schools and teachers have begun to pay attention to the individual needs of students. These new educational concepts will substantially impact teachers' technology and pedagogical knowledge when gradually introduced into classroom teaching. They will promote in-depth changes in teachers' teaching methods and students' learning methods. Especially during the COVID-19 pandemic, countries have used Internet technology to carry out online teaching. Online teaching, which is separated from school education, has triggered an upgrade of the classroom teaching model to a greater extent. Some studies have shown that the pandemic outbreak has led to a massive change in the teaching model (Cheng et al., 2020).

Educational Equity Has Become the Strategic Focus of Education Informatization in Developing Countries

Educational equity issues exist at different levels in the development process of education in various countries. There are specific differences in the level of educational development between regions, races, and nationalities. Especially with the development of informatization, the digital gap characterized by the ability to obtain information is expanding. The Global Information Technology Report 2015 pointed out that "the digital gap between countries is expanding," which will exacerbate the "global learning crisis" (Dutta et al., 2015). The digital gap refers to the unbalanced performance of specialized hardware and software resources. Still, it is also reflected in the gap in the individual's ability to obtain information and behavioral awareness. As a result, as the digital gap between countries in the world expands, the power of citizens to get information will also grow.

To respond to the possible Global Learning Crisis and promote education equity, the U.S. government has prioritized developing remote and backward rural areas. Special attention will be paid to education policies for particular groups, and education informatization policies will be implemented in economically underdeveloped areas to help poverty-stricken areas and rural schools to cross the digital gap. The *E-Strategy Strategic* Plan of the British government proposes to provide national broadband ser-

vices to all institutions, especially the development of ICT infrastructure and services for disadvantaged groups (Office for National Statistics, 2021). Invest in technology for students in a dire economic situation so that ordinary students or students with disabilities in these schools can use the same advanced technology. Due to national conditions and other reasons, in the development of basic education informatization, China particularly emphasizes narrowing the gap in infrastructure and digital resources between the east and the west and between urban and rural areas. It also requires a number of measures to support the development of basic education informatization in economically underdeveloped regions.

Therefore, ensuring that every child can receive high-quality education has become the focus of educational development in all world regions. However, the Global Learning Crisis is still emerging. Even in developed countries and areas with a high level of economic growth and a good level of information technology, the teaching mode supported by the technological environment does not fully reflect the learner-centered approach. A large proportion of various teaching models are still teacher-centered. Only by reducing the digital gap and strengthening the learning design in the technological environment can the situation of the Global Learning Crisis be further improved.

The exchanges between different cultures and economies brought about by globalization make people face the critical role of education in communication, cooperation, and competition. Moreover, educational technology and reforms under different social conditions and backgrounds are integrated with different degrees and methods. Therefore, when researching education models and education development, it is necessary to understand the development trends of various countries from a higher level. And it is essential to face the growth of global education to take care of the reality of education in the country and strive to achieve the integration of internationalization and localization of education.

Notes

1. *"Three links and two platforms" refer to broadband network school-school links, high-quality resources, class-to-class links, and network learning spaces for everyone; construction of a public service platform for educational resources and a public service platform for education management.*

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REVIEW

How to Use Activities to Realize the Self-Management of Middle School Students?

Weijie Meng, Fengqi Ning

Nanjing Yutong Experimental School, Nanjing 211100, Jiangsu, China

***Abstract**: Cultivating students' self-management ability is the requirement of social development and the progress of the times to school education, and it is also the need for students' growth. For middle school students in adolescence and undergoing tremendous changes in their body and mind, its significance is even more prominent. As an element of direct contact with students, activities play an irreplaceable role in cultivating students' self-management ability. Nanjing Yutong Experimental School has added a self-management course to its teaching plan. Through the development of diversified activities, goals are achieved in specific activities, and the overall development of students has been completed. Taking the school's practical activities as an example, this paper attempted to use the concept of activity teaching to explain better how the school develops self-management of middle school students based on students' development and creates activities suitable for students' growth to realize better students realize self-management in activities.*

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About the Author: *Weijie Meng, Principal of Nanjing Yutong Experimental School, 22 Jiangjun Avenue, Jiangning District, Nanjing 211100, Jiangsu, China. E-mail: 13608955415@126.com*

Correspondence to: *Fengqi Ning, Nanjing Yutong Experimental School, 22 Jiangjun Avenue, Jiangning District, Nanjing 211100, Jiangsu, China. E-mail: 872225979@qq.com*

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Introduction

SELF-management is a skill that allows people to control their thoughts, emotions, and actions. The ability of self-management is reflected in assessing problems, setting goals, and monitoring the time and environmental factors that hinder the achievement of goals (Frayne, 1991). This concept was initially applied in management through the distribution and transfers of responsibilities and authorities so that individuals at all levels in a large community can give full play to their initiative and jointly promote goals. Later, the concept of self-management gradually shifted to many aspects such as health, psychology, and social interaction and progressively expanded the idea of extension.

As many countries in the world began educational reforms in the 1980s, educational methods have gradually changed. Self-management has steadily been applied in education because it emphasizes the survival and development of individuals. Unlike the management field that produced this concept, its research and application in the education field are more inclined to cultivate students' self-management ability (Meng & Ning, 2021).

Since implementing the new curriculum reform at the beginning of the 21st century, China has developed students' comprehensive quality and emphasized autonomy. Therefore, the school must implement student self-management, allowing students to actively adjust the plan based on their situation and learning status and ultimately achieve their goals, thereby promoting the joint development of individual students and the school. In the specific implementation process, establishing goals, creating content and creating activities are the necessary foundations and conditions to ensure the success of students' self-management (Li, 2011). Among them, activity, as the fundamental way of human existence and development, realizes human needs or goals through the transformation of the surrounding reality and is the basis of individual development. Furthermore, as the essential existence of activities, the education and teaching system enriches the activity's connotation, carries forward the activity teaching in it, and realizes the construction of the activity teaching system. Therefore, activities as the basic unit of activity teaching should become the basic structure of activity teaching, provide practical entry points for promoting students' all-round development, and provide essential support for developing and constructing students' self-management (Wang, 2010).

In addition, from a philosophical point of view, the essence of self-management is "socialized management based on communicative practice, which must be able to meet people's needs for self-realization, reflect their free personality, and enrich their social relationships." Unfortunately, in the school environment, the "practice of communication" is relatively single, so the ability of students to be cultivated in the traditional teaching environment is also limited" (Wang & Pan, 2006). Therefore, to expand students' abilities, especially self-management abilities based on autonomy, it is

necessary to construct a suitable environment to develop fully. Therefore, rich activities are of great significance for cultivating students' self-management ability.

Based on previous studies, this research will in-depth explore the mechanism of activities for students' self-management from the perspective of the significance and role of activity teaching in cultivating students' self-management ability, combined with the practical experience of Nanjing Yutong Experimental School. Thus, it helps develop more educational value in activities and provides reference and reference for educational practitioners.

Literature Review

The idea of "active teaching" in the history of world education can be traced back to the European Renaissance. Its purpose is to oppose rigorous book learning and allow children to accumulate knowledge and experience through various practical activities such as observation, investigation, play, and labor (Tian, 1998). After that, this spirit continued to develop in the modern romantic education thought represented by Rousseau. Educators advocated that education should adapt to students' natural development and that all knowledge obtained from experience should be obtained from practice instead of books (Noone, 1972). Fröbel (1895) also put forward the idea of promoting the free, collaborative, and multi-faceted development of the inner nature of children. Under this idea, play, homework, labor, and object teaching have been integrated into teaching methods.

In the first half of the 20th century, the educational idea of "learning by doing" was put forward with Dewey's system. The role of school education has been expanded. In addition to imparting knowledge, there is also the transfer, exchange, and development of experience (Dewey, 1938). His thinking has developed more in contemporary times. On the one hand, Piaget proposed that "people's understanding of objects begins with their activities on objects" from the cognitive level. Activities provide essential support for accumulating knowledge and the development of thinking (Piaget, 1982). On the other hand, the Soviet Union Vygotsky and other scholars introduced the Marxist concept of "practice" into teaching. They proposed that humans improve their development by practicing the subject to the object (Toomela, 2008).

Soviet psychologist A.N. Leontyev (1903-1979) made a systematic study of activities. In the book "Soviet Psychology," edited and published by R.B. Winn in 1961, Leontyev defined activity as the sum of various actions united by a common purpose to complete a particular social function. He believes that the generation of personality is not a natural process. Instead, the result of the behavior is related to the social relationship. In this process, education is a crucial factor. Then put forward the doctrine of activity theory, consciousness theory, and psychological personality characteristics (Winn, 1961). Under his influence, researchers began to focus on activities from the outside to the inside, paying particular attention to the nature of the activities.

Activity teaching in China started relatively late. Xingzhi Tao's "life education" proposed in the 1920s and 1930s, was considered the source of China's exploration of

activity education (Tao, 2018). Subsequently, Heqin Chen proposed the practice of "activity education" (Zhu, 2013). Until the early 1990s, the Chinese Education Commission included activity courses in the nine-year compulsory education curriculum plan, marking the widespread recognition of the concept of "activity teaching" in the domestic education system. Its purpose is to explore a new teaching model and the traditional teaching methods characterized by knowledge-based, teacher-centered, imparting, and instillation to better develop their subjectivity in a diversified learning model (Yang, 1999).

Judging from the current research in China, the recent research on activity education focuses on designing educational activities in venues and campus language applications. However, the teaching significance of campus cultural festivals and agricultural education activities frequently launched in China's secondary education has not yet been explored. Therefore, these activities have not been effectively designed on the educational level. In the design of the school's self-management activities, Nanjing Yutong Experimental School bases itself on the educational function of the activities, gives full play to its advantages, and makes up for the limitations of the traditional education model.

Activity Teaching Practice in Nanjing Yutong Experimental School

The "activity" in teaching has a specific connotation. It is different from human activity in the general sense-labor and different from "activity" in traditional schooling. It emphasizes students' autonomous participation, a practical activity based on students' learning interest and internal needs, characterized by active exploration, transformation, and transformation of activity objects, and aimed at achieving the comprehensive development of students' primary abilities (Zhong, 2005).

Since the beginning of 2014, Nanjing Yutong Experimental School has been based on the development needs of students, absorbing advanced theoretical knowledge, and constantly innovating educational management methods. They have built a set of management methods for students' independent experience, independent development, and independent innovation, covering all the contents of students' school and school, life, and activities. In creating activities, the school is based on student development and has designed various activities for students from the two dimensions of inside and outside the school. Help students realize self-design, self-regulation, and self-evaluation in activities. In the end, students will continuously improve their sense of autonomy and self-help growth in experience and practice, form excellent social citizenship, and move towards self-education.

Development of Off-Campus Activities

- **"Four Festivals and One Party"**

"Four Festivals and One Party" is a campus activity designed by Nanjing Yutong Experimental School to cultivate students' self-management ability. It consists of a sports food festival, a science and technology festival, a reading festival, an art festival, and a New Year's Day party. These activities have a longer time dimension, and students should make their activity plans to ensure full participation as much as possible.

(i) Sports Food Festival

This activity is set up to cultivate students' awareness of health management, integrating physical exercise and healthy eating. It is hoped that students can transfer their emphasis on these two aspects from activities to daily life.

The preparation period for the course activities is six weeks. The festival is the final presentation form of the course. In the six weeks of preparation, students need to complete the goal setting for sports and diet items, preparation of activity materials, drafting evaluation standards, and setting up activities scenes under the guidance of teachers. It integrates many elements of cultivating students' self-management ability, such as goal setting and progress control. This process allows students to understand that the formation of goals is not accomplished overnight in a management process. It can be gradually finalized through repeated adjustments and become a feasible target. The consciousness formed through the activity is transferred to the students' understanding of the setting of learning goals through the teacher's guidance. It can also look at the goal-setting from a more objective and rational perspective in the learning process and work hard to achieve the goal.

(ii) Science and Technology Festival

The design idea of this activity is to refer to popular science images, basic science experiments, and knowledge in the classroom. It provides a concrete perceptual realization of abstract knowledge in the school and enhances students' understanding of science and technology intangible and sensible practical activities.

The activity consists of four sections: science popularization, experimentation, production, and competition. Set different content according to different school stages. The design of science popularization and investigation echoes the knowledge points encountered in each school's mathematics, physics, biology, and chemistry classes to extend the classroom knowledge in campus activities. In each type of activity, teachers set up significant themes, such as introducing students to building block robots and artificial intelligence applications in education and other fields. This allows them to establish basic concepts for the frontier applications of science and introduce more abstract projects such as cloud computing to explore.

The part of the experimental design is benchmarked against the level of science knowledge in each section. The activity design allows students to enter the knowledge situation, stimulate their curiosity, let their spontaneous thirst for knowledge drive them, and take the initiative to obtain knowledge. Then build the concept of students' self-management of learning progress, make it clear that the effectiveness of their self-

management is closely related to their learning motivation, and integrate this awareness into daily learning.

(iii) Reading Festival

The reading festival activities aim to broaden students' reading range, cultivate students' reading interest, and at the same time build a scholarly campus with a good reading atmosphere. First of all, the establishment of reading festival activities is to expand students' knowledge of books. In this link, the school has designed a number of reading-themed sections. Furthermore, by guiding students to understand the world's diversity in books, students will be inspired to read independently.

Secondly, it is to cultivate students' comprehensive reading ability. The reading festival includes reading books and the appreciation and analysis of film and television works adapted from literary classics, recitations, and calligraphy. The scope of employment is not only Chinese books but also English works. Through such a comprehensive introduction and stimulating activities, students gradually realize the world's diversity in books during their participation in the activities, forming the habit of reading and exploring.

(iv) Art Festival

The art festival is held in the hope of using the spiritual value of art to adjust, improve, enrich, and develop students' spiritual lives and improve students' spiritual quality. The activity time is six weeks. At the same time, it includes two categories of music and fine arts and comprehensively enhances students' artistic aesthetic ability, artistic perception ability, and individualized expression ability.

Music and images are different means of expressing life than words. Text is frequently used by students, while music and images are often not the first choices. The school strives to cultivate students' perception of the environment and diversified performance capabilities in the art festival. Self-management puts forward requirements for the individual's ability to perceive the environment. The use of artistic means to express life promotes students' observation and description of the environment to cultivate students' ability to recognize the environment.

• Study Trip Activities

The school has designed research trip activities for students of different stages to broaden their horizons and integrate knowledge. The destinations include the Crater Sapphire Museum with the theme of understanding natural landscapes and the Dongying Yellow River Delta Wetland Museum. In addition, there are memorial halls of Menglianggu and Yantai Haiyang Landmine Warfare for historical themes. In addition, they travel to cities such as Qingdao and Zibo that have built a comprehensive understanding of the region.

Study Trip Activities are the training and test of comprehensive abilities such as student life management, collective awareness, and knowledge accumulation. In this activity, students need to coordinate the relationship between personal rhythm of life and group activities and mobilize the knowledge acquired in school during the activity, such as plate movement, geological structure, Menglianggu battle, paleontological activity trajectory, and so on. If students do not bring knowledge from the classroom to life well, they need teachers to guide them in research and study to promote the awareness that the knowledge formed by students is comprehensive in life. Classroom knowledge provides a medium for understanding the world. In real life, actors need to use existing knowledge and learning ability to acquire new knowledge spontaneously. This process of active learning is also the process of mobilizing self-management consciousness.

• 65 km Hiking and Training Activities

The 65 km is a challenge to design for students within the range of their physical abilities. It aims to repeatedly strengthen their will by allowing students to complete a seemingly tricky goal; simultaneously, they build their cognition. Many students question their abilities when they see goal setting, thinking that the task is impossible to complete. However, they have spontaneously mobilized their physical management ability and judge the external environment to achieve their goals in actual actions.

Although hiking and training activities are external goals, teachers can only give students a certain amount of spiritual encouragement and strategic guidance in this kind of physical activity. The actual process of achieving the goal is entirely dependent on the students' self-management. This is a very effective process of mobilizing students' self-management ability. Due to the irreplaceability of the main body of physical activity, training in such activities may be more effective than the self-management awareness deliberately cultivated in classroom learning.

After the activity, there is the link of sentiment exchange, which is how the teacher guides the students to transfer this self-management ability from physical fitness to the field of knowledge mastery, ensuring the value of the activity.

• Volunteer Activities and Festival-Themed Activities

Volunteer activities are designed to promote students' empathy and awareness of serving others. At the middle school stage, students' abilities are limited. They will have the idea of helping others, but they have not established an apparent ability-behavioral awareness. Therefore, schools need to provide a straightforward design and change tasks as the students' ability grows. At the same time, serving others is inspiring students to mobilize existing knowledge and ideas. Strengthen one's cognition through the output of knowledge and skills. The method of helping others places demands on students' sense of responsibility. In this process, students can repeatedly strengthen their sense of responsibility, connect their commitment to others with their duty, and improve their personal qualities in all aspects.

Festival theme activities aim to cultivate students' sense of social responsibility, encourage students to feel the society, integrate into the times, and build an understanding of the subject in the social background.

A comprehensive inspection of the design of Nanjing Yutong Experimental School in non-teaching activities shows that the school consciously adopts informal learning methods and the construction of the activity environment. They allow students to spontaneously generate interest in knowledge in practice to carry out independent learning and exploration. The school's activity goals are comprehensive, not only to mobilize students to take the initiative to obtain knowledge but also to pursue the overall development of students' bodies and minds. Complete students' living ability, aesthetic consciousness, and self-management ability, these qualities do not have enough room for training in traditional classroom teaching. Therefore, incorporating activity teaching into the school's classic curriculum design enriches the teaching methods and supplements the shortcomings caused by the long-term "cognition-only teaching."

Design of School Activities

- **Realize Student Self-Management through Multiple Channels Through the Construction of Classes, Grades, and Clubs**

The school sets up departments for student management roles in classes and grades. First, build a democratic management team based on the self-management team of the course and linked by the student union and the league of associations. Through the training of the school student union, grade student union, class self-management team, and students' project management ability, a complete self-management system has been established from the school student union, grade student union, the class self-management team, to study group leader and house head. This allows each student to participate in various management organizations according to their wishes, build a strong management organization structure where everyone participates, and everyone is responsible, stimulates the enthusiasm for participating in class building, and cultivates the spirit of independent management and responsibility.

(i) Group Building Activities in the Class

The "Student One Day Standard" is adopted to conduct self-management in the class because they are familiar with this standard. At the same time, a student administrator is set up to assist students in forming a sense of self-management. In the implementation process, this training goal is achieved through group management and on-duty class leader.

Group management is a self-management training model based on the principle of "homogeneity between groups and heterogeneity between groups." Let students with

different intelligence levels, thinking styles, cognitive styles, and tastes become group members to achieve complementarities of gender, personality, and abilities.

The shift leader on duty is carried out in a post-rotation system. Thus, every student can experience the functions of managers and understand the differences between managers and management objects. In performing management, managers need to regulate students' behavior and record and encourage them to consciously exert their strengths.

When students manage class life and study affairs as managers, they exercise their observation and judgment ability and sense of responsibility and establish their responsibilities. In the process of self-management, students are both managers and objects of management. However, students' daily identities are mostly management objects, and they are relatively unfamiliar with the responsibilities and duties of managers. Therefore, let students manage others first to mobilize their sense of responsibility and action to enhance their self-management ability.

(ii) Grades and Club Activities

The self-management training has content aimed at students' ability to judge the environment. The environment includes both the natural environment and the social environment. Students' ability to evaluate the natural environment is trained in off-campus activities, while the training to judge the social environment is carried out in the school's student groups.

Compared with daily class activities, student union activities can create collaborative relationships with clear goals. By organizing students to work together for a set goal, students need to judge their abilities, the progress of completing the task, and grasp the situation of others in time, to negotiate and adjust in time to ensure that the goal is achieved as planned. The school holds a plenary meeting of the student congress every semester to vote on proposals and significant resolutions. The implementation of the solutions and recommendations of the student congress should be reported to the representatives and students promptly. Its work status should be announced to the students and subject to student supervision. In addition, the Standing Committee of the Student Congress is responsible for supervising the implementation of the work of the Student Union and the League of Associations and is accountable for their work. The internal meeting of the Standing Committee of the Student Congress is held once a month to discuss work planning.

The Association of Associations shall actively organize research and feedback on the activities of associations once a month. It must not only ensure the effectiveness of club activities but also ensure the discipline of club activities. Furthermore, research and feedback help clubs grow and standardize the domain of student club activities. At the end of the semester, it is necessary to organize the evaluation of clubs, implement the credits for club activities, select high-quality clubs, and promote the development and improvement of campus club activities.

In the student union and club activities, students have enriched their practical experience and mastered interacting with others, evaluating their environment, and adjusting their status. This realizes the comprehensive development of self-awareness and the improvement of its self-management awareness.

(iii) Cultivate Students' Self-Directed Learning through Classroom Teaching of "Large Unit Holistic Learning"

The overall learning of the large unit is based on the curriculum standards and the knowledge structure, ability structure, logical structure, value meaning structure of the subject, and the subject's core concepts as the fundamental basis, allowing students to recognize and construct the whole autonomously. This is a learning method for making subject knowledge in activity cognition. The basic understanding of the subject guides its design idea by promoting students to master the basic knowledge while incorporating it into real situations for practice and giving students the autonomy of technique. It allows them to increase their self-management ability while getting knowledge independently.

Although considerable unit learning is traditional cognitive-oriented teaching, the teaching process has been adjusted during this learning process. From the perspective of cultivating students' autonomy, it integrates students' self-preparation before class. Students should self-prepare and complete the guidance plan, and the teacher will teach further knowledge on this basis. The assessment of this learning model is conducted by the student council once a week and once every two weeks for the grade. The survey results are presented in the form of 5 points, 4 points, and 3 points. Thus, the assessment of learning results is more frequent. In addition, the grading mode is flexible, which builds a smaller study period for students to inspect the learning results, which is convenient for students to adjust the learning mode in time to obtain better results.

(iv) Use 271BAY Smart Education Cloud Platform to Provide Support for Students' Self-Management

In addition to daily activities, the school provides a solid technical guarantee for implementing student self-management through the school-based smart campus cloud platform 271BAY. It is a platform for school students to learn, communicate, evaluate, and grow independently, a platform for teachers and students to share with the outside world, and home-school co-education.

On the one hand, the relevant external high-quality teaching resources on the Internet provided by the 271BAY resource platform and the high-quality teaching resources uploaded by the teachers of 271 Education Group are available for school teachers and students to use. On the other hand, the hierarchical push of 271BAY resources can realize students' personalized hierarchical teaching, conducive to students'

independent learning. In addition, 271BAY has a record system covering the whole process of learning and growth. Collecting student classroom data, off-class data, life health, and other data support students in establishing a growth model based on data analysis. A diversified, whole-process digital record will dynamically present the development of students, and an evaluation of results will be generated in real-time through the learning network. In this process, parents pay attention to the students' growth dynamics in time, obtain student growth data, and provide a scientific basis for guiding students' growth.

Conclusions

This article outlines the student self-management carried out by Nanjing Yutong Experimental School on the concept of activity teaching. The school is consciously developing the educational significance of various activities, and the goal of the activities is to cultivate students' comprehensive ability. Therefore, this is not only a supplement to classroom knowledge but also an extension of teaching boundaries.

Campus activities with self-management significance are designed to give each workout a clear training goal, value recognition, responsibility, problem-solving and creative culture. The constructive orientation in the activity design allows the activity subject to complete the self-set goals autonomously and actively during the activation process. Creativity and initiative have sufficient space for development. As Dewey said, "Education is not a matter of 'telling' and being told, but an active and constructive process." The design of these activities emphasizes "proactive" and "constructive."

Most middle schools have a certain amount of campus or off-campus interactive design, such as learning agriculture, campus cultural festivals, etc. They all aim to cultivate certain specific qualities of students, and they also require students to summarize and report on their gains after the activity. However, neither the early-stage activity design nor the mid-term activity implementation has clear regulations, resulting in similar activity items and loose organization of the activation process. When designing activities, the school fully considers the integrity of the development of student's abilities. It constantly improves the guarantee of the campus system to ensure the effectiveness of the activities. Promote students' internal activities (psychology, emotion, will) through external practical activities.

At the same time, we have also discovered some possible problems in our investigation and practice, and these problems have also triggered some thinking. For example, in the presentation of the purpose of the activity, the purpose of the Nanjing Yutong Experimental School needs to be broadened. At present, the school is designing activity items and content with the idea of supplementing the shortcomings of classroom teaching with activities instead of exploring the teaching effectiveness of exclusive activities starting from activities.

In addition, effective activity education requires the cooperation of the activity venue. Places that do not have an evident educational orientation lack practical guidance for students' self-management, which will cause students to participate in activi-

ties. Still, it is impossible to clarify the self-goal in the activity. Therefore, schools should be more cautious when choosing non-campus activity scenes. The educational facilities of the off-campus activity venues currently selected by the school still need to be improved. There is still room for improvement as an informal learning environment. Schools may consider co-construction with media where activity education is routinely carried out to promote the collaborative and in-depth development of activity education inside and outside the school.

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