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Article

Teachers' and Students' Views of Using an AI-Aided Educational Platform for Supporting Teaching and Learning at Chinese Schools

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Abstract: In Chinese schools in less advanced places, there is an urgent need to improve the quality of education and educational equity. This study aims to investigate how an AI-aided educational platform can be used to provide additional teaching and learning resources to serve this need. The AI-aided educational platform used in this study is called Smart-Learning Partner (SLP), which is based on AI technology to provide new opportunities for personalized learning and more educational resources. A qualitative research method was applied in this study. We interviewed and surveyed 98 students and 32 teachers at 9 Chinese schools located in less developed areas. We used content analysis to interpret the findings based on students' and teachers' experiences of using the SLP platform. The data demonstrated that this kind of AI-aided educational platform was viewed by students and teachers as a useful tool in students' learning and teachers' work. It provided additional possibilities to students and teachers with its rich assessment tools, personalized and overall student learning analysis reports, plentiful high-quality mini-lecture videos, and recommendations from the platform based on the students' needs for further enhancement study. However, challenges still exist. Adequate electronic devices for students are needed, especially in schools in less developed areas. Students and teachers called for user-friendly interfaces and features, social interaction aspects, and gamification mechanisms with recent online learning platforms. We conclude that based on the teachers' and students' views, AI-aided education platforms are useful tools for supporting teaching and learning in Chinese school.

Keywords: artificial intelligence (AI); AI-aided educational platform; quality education; teaching and learning

1. Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) [1] set sustainability development goals to address current global challenges, such as climate change, poverty, hunger inequalities, low quality education, and other serious global problems or crises. The fourth sustainability development goal is quality education, and we believe that quality education is the basis for all other sustainability development goals. As UNESCO [1] stated, education is an important goal for a sustainable future, and educators are seeking effective ways to achieve quality teaching and develop learning possibilities. Technology, especially AI technology, was proposed as a solution to meet the challenge. UNESCO Strategy on Technological Innovation in Education (2022–2025) [2] stated: "The strategy supports human-centered innovation in the use of technologies for education to help ensure equitable and inclusive quality education and lifelong learning opportunities for all (p. 1)". UNESCO Policy Guidelines for Mobile Learning [3] also listed many unique

benefits of mobile learning, such as promoting equity of education, facilitating personalized learning, providing immediate feedback and assessments, enabling anytime, anywhere learning, etc. It is clear, therefore, that using technology in education creates new options and possibilities for learners, and promotes equity as well as inclusiveness in education. Here, in this article, we focus on investigating how to use AI technology for supporting teaching and learning in Chinese schools to achieve sustainability development goals in education.

Currently, with the rapid development in AI technology, AI is having a huge impact on societies, organizations, work, and education. Applying AI in education has a long history, going back to at least the 1960s [4]. Nowadays, an increasing number of AI associated applications are used in the education field, such as robot teachers, Intelligent Tutoring Systems (ITS), massive online learning courses (MOOCs), etc. [5]. AI technology can be one of the enablers to provide the means for quality education. Using AI technologies for supporting teaching and learning in schools became an important aim among other educational goals in many countries. However, few studies addressed how to use AI technology for supporting teaching and learning in schools in less developed areas. Furthermore, there is also a major concern about how to utilize the high-quality resources found in the wealthier cities to benefit schools in less advantaged areas that have limited resources and fewer qualified teachers.

The purpose of this study is to investigate how an AI-aided educational platform, called SLP, can be used to provide additional teaching and learning resources at Chinese schools.

1.1. Theoretical Framework of the Study

In the last few decades, AI technology was widely used in various fields, as well as in learning and education. Regarding the traditional education context, many studies [6,7] show that Machine Learning (ML), Learning Analytics (LA), Big Data, and Educational Data Mining (EDM) are important tools for personalized learning in the current use of AI in Education (AIED). The main applications of AIED are to provide intelligent agents and tutors with services through AI-supported platforms [8–10]. With the fast development of LA, ML, and Big Data, ITS advanced rapidly. ITS can provide customized tutoring functions based on learners' needs [11]. With the connectivity features and vast coverage of the Internet, as well as the availability of mobile devices, learners can gain access to quality educational materials and resources wherever and whenever they wish, regardless of location or time. Several researchers [9,10] pointed out that AI technology provides more options and improves the quality of education.

In this study, we investigate how one AI-aided SLP educational platform is used to improve quality education at Chinese schools. This educational platform was developed by the Advanced Innovation Center for Future Education at Beijing Normal University [12–15]. Users, such as students and teachers, can easily access the platform at anytime and anywhere by using smart devices, such as computers, iPads, and mobile phones.

This SLP platform combined several LA, ML, and EDM technologies with a number of learning theories [12]. It is intended to function as a learning assistant at school [13–15]. It has a data aggregation module [12] that takes in and accumulates data and resources, such as continuous data collecting based on students' learning, as well as mini video lectures and assessment tools created by educational experts. The main AI used in this system is the knowledge-based recommendation approach, which collects and analyzes the data (including both knowledge structure and cognitive state) to generate the adaptive leaning cognitive map and then make personalized learning recommendations (e.g., learning materials) accordingly [14]. The student knowledge status can be estimated using deep learning techniques in an accurate and explainable way [16–18]. Specifically, the deep learning-based knowledge tracing models can be used, which utilize the trained recurrent neural networks to estimate whether the individual student mastered the fine-grained concepts. The explainable Artificial Intelligence (xAI) techniques are performed to interpret the estimation results, which could help both teachers and students to understand the plat-

form's decisions. Moreover, the Conditional Random Field (CRF) method and probabilistic association rule mining algorithm are used to auto-construct the knowledge graph for the subjects [19].

The SLP platform provides four major functions for learning and teaching purposes [12]. The first function is to provide the diagnosis assessment tools that can be used by students for self-assessment and can also be used by teachers to conduct students' assessments when teaching courses. The second function is to provide students with learning reports—students can see how well they are learning in their studies at a particular time as well as over a longer time period (in which areas they do well in areas and what needs to be improved). Teachers can also see the overall learning situation of the whole class, as well as individual students' learning. Based on the information of students' learning, teachers can better adjust their teaching according to their students' needs. The third function is recommending additional learning materials, such as mini video lectures, to the students for further study based on students' interests and needs. The teachers can also use those materials in their teaching courses. The fourth function is to provide suggestions for improvements to students and teachers based on the students' assessment results and learning reports. The four major functions in SLP for students and teachers are summarized in Table 1.

Table 1. Major functions in SLP.

	Functions	Description of the Steps
1	Assessments	- Students can use various assessment tools for self-assessments. - Teachers can use the ready-made assessment tools in their course or as homework assignments or conduct diagnosis assessments to find out the students' learning situations.
2	Learning reports	- Students can see visual reports of their learning at any particular time as well as their learning progress change over a longer period of time. - Teachers can see visual reports of all students and individual student's learning situations at any particular time as well as the changes over a longer period of time.
3	Resources	- Students can access various learning materials, such as mini video lectures to study by themselves either based on their teachers' suggestions, the platform's recommendations, or their own interests. - Teachers can also access and use all the materials from the platform for their teaching.
4	Learning enhancement	- Based on their learning reports, students receive suggestions from the platform or teachers concerning their learning enhancement. - Teachers receive suggestions from the platform concerning their teaching or they can give suggestions of using certain materials in the platform to students to enhance their learning.

Additionally, this SLP platform connects with another open access service application. Students can use service applications to obtain one-to-one tutoring support from a real teacher from another location through this application. This support involves Internet remote connection after school whenever students encounter difficulties in their studies and need some form of support. Highly qualified and experienced teachers are selected to provide the services to the students. The selected teachers are paid by the government and the service is free for students. It provides more studying options for students in less advantaged areas or areas that are lacking educational resources. This service application is called "double-teachers," which means that students can have their own teachers from their schools, and they can also receive help from online teachers via the service application. This service function in the SLP will not be addressed in this article. A separate study will discuss this service function in SLP concerning how to provide additional teaching resources to Chinese schools.

1.2. Study Design and Research Questions

In this study, we examine how the AI-aided SLP is used to support teaching and learning in Chinese schools. The aim of this study is to explore how the AI-aided educational platform was used by teachers and students and what their views and experiences of using

the SLP platform were. In this study, we focus on the students' and teachers' feedback and experiences using the AI-aided SLP.

We intend to investigate the following research questions:

- What are the students' views in Chinese schools about using the AI-aided SLP educational platform in their studying?

  ○ What kind of functions in SLP did the students use?
  ○ What kind of best experiences and changes did the students have?
  ○ What kind of challenges and improvement suggestions did the students have?

- What are the teachers' views in Chinese schools about using the AI-aided SLP educational platform in their work?

  ○ What kind of functions in SLP did the teachers use?
  ○ What kind of best experiences and changes did the teachers have?
  ○ What kind of challenges and improvement suggestions did the teachers have?

2. Materials and Methods

In this study, we collected data between 2021 and 2022 from students and teachers in Chinese lower secondary schools where they used the SLP platform for teaching and learning. Table 2 displays the participants and data collection methods in this study.

Table 2. The participants and data collection methods in this study.

Schools (9 Schools)	Student Participants (98 Students)	Data Collection Method	Teacher Participants (32 Teachers)	Data Collection Method
School 1	2	Group interview	3	Group interview
School 2	2 + 15	Group interview + Survey	2	Group interview
School 3	2 + 13	Group interview + Survey	3	Group interview
School 4	2	Group interview	2	Group interview
School 5	2	Group interview	2	Group interview
School 6	4	Group interview	3	Group interview
School 7	20	Survey	6	Survey
School 8	17	Survey	6	Survey
School 9	19	Survey	5	Survey

We collected data from students and teachers at grade 7–9 from 9 lower secondary Chinese schools. All students and teachers used the SLP platform before and had experiences of using SLP. We used both an interview and a survey for data collection. A total of 9 schools, 98 students, and 32 teachers voluntarily participated in this study. Tables 3 and 4 present the demographics of the student and teacher participants in this study.

Table 3. The demographics of the student participants [1] in this study.

Gender		Grade			How Long SLP Used			How Many Times SLP Used per Week			
Girls	Boys	7th	8th	9th	<1 Year	1–2 Years	>2 Years	<1	1–3	4–7	>7
60	38	17	32	49	17	16	66	22	56	14	6
61%	39%	17%	33%	50%	17%	16%	67%	23%	57%	14%	6%

[1] The total number of student participants was 98.

Table 4. The demographics of the teacher participants [2] in this study.

Gender		Teaching Subjects			How Long SLP Used			How Many Times SLP Used per Week			
Female	Male	Languages	Science	Others	<1 Year	1–2 Years	>2 Years	<1	1–3	4–7	>7
22	10	9	15	8	3	21	8	7	23	2	0
68%	31%	28%	47%	25%	9%	66%	25%	22%	72%	6%	0%

[2] The total number of teacher participants was 32.

Table 3 shows that girls participated more actively than boys in this study. There was an increased number of users from 7th grade to 9th grade. The majority of student participants (67%) were experienced users and used the SLP platform for over two years. Slightly over half of the student participants (57%) used SLP 1–3 times per week.

Table 4 shows that female teachers participated more actively than males in this study. Science teachers (47%) and language teachers (28%) were the majority of the users of the platform. The majority of the teacher participants (66%) used the SLP platform between one and two years. The majority of the teacher participants (72%) used SLP 1–3 times per week.

All participants took part in this study voluntarily. The participants were informed about confidentiality and the possibility of withdrawing from the study at any time. All participants' personal information was removed and cannot be identified in this study. All the interview data were voice recorded and transcribed.

We asked the same questions both in an interview and in the questionnaire survey from students and teachers as illustrated in Table 5.

Table 5. Questions for students/teachers used in interview and in questionnaire survey.

	Questions for Students/Teachers
Part one	Background information: age, gender, grade you study/teach at. How long have you used the SLP platform? How many times did you use SLP per week?
Part two	Open-ended questions Based on your experience of using the SLP platform, what is your overall feeling/feedbacks? How do you use the SLP in your studies/teaching? Please give some concrete examples. Does the SLP help you in your studies/teaching? If the answer is yes, in what ways does SLP support you in your studies/teaching? What kind of changes did you notice after you started using the SLP platform? For example, any changes in your studies/teaching, or your way of learning/teaching, or way of thinking? What were the best experiences you had when using SLP in your studies/teaching? What part did you like most? Please give examples. What are the main challenges you encountered when using SLP? Which part do you not like? What is the reason for this? Do you have any suggestions for improvement? Please give concrete examples to illustrate your point. Do you have any wishes or suggestions about how the SLP can be improved to better support you in your studies/teaching? Any other things or thoughts you want to share with us about using SLP in your studies/teaching?

The content analysis was applied to the qualitative data to identify the key information. The data analysis followed the SLP main function and the key words in the questions from the interview and survey. The data analysis is illustrated in Table 6.

Three experienced researchers analyzed the qualitative data using content analysis. They also discussed the data analysis to achieve a synthesis in the data interpretation. The data analysis revealed the major ways in which the SLP platform assisted teaching and learning at school. We strove to identify how these aspects assisted in teaching and learning at school by looking at the students' and teachers' feedback and experiences. Additionally, we aimed to identify the major challenges and further improvements in these kinds of learning platforms.

Table 6. The data analysis process in this study.

Category	Codes	Extracted Data Example
Overall experiences	Feelings, usefulness, etc.	- Very good, it is helpful for my study. (Student) - There are many resources in this platform. Very useful in my work. (Teacher)
In which ways to use	Functions: assessment, learning reports, mini video lectures, recommendations, etc. Ways of supporting learning/teaching, etc.	- I watched the mini video lectures in SLP. (Student) - I am able to provide personalized teaching based on the students' learning reports. (Teacher)
Changes	Ways of learning/teaching, attitudes	- I become more active in my study. (Student) - My work became easier. I used assessment tools for students' homework with automatic marking. (Teacher)
Best experiences	Feelings, usefulness, functions, etc.	- I like to watch the mini video lectures as they are helpful for my studies. (Student) - What I like most is the functions of diagnostics assessment and the students' learning reports in the platform so that I can see the students' learning situation right away. (Teacher)
Challenges	Difficulties in using, etc.	- Too many mandatory SW updates. (Student) - Not all students have adequate electronic devices. (Teacher)
Suggestions	Functional aspect, social aspect, etc.	- User interface could be improved. (Student) - We need some training to use the platform. (Teacher)

3. Results

In this section, we present the findings in accordance with the research questions proposed in this study. When presenting the data with the quotes, School 1 Student 1 is referred to as Sch1S1, and School 1Teacher 1 is referred to as Sch1T1. The same rule of coding the participant is applied for each participant's data quote in this article.

3.1. The Students' Views about Using the AI-Aided SLP Educational Platform

We analyzed the responses from the 98 student participants and presented the results of the students' views about using the AI-aided SLP educational platform. The data analysis showed that 81 students (83%) stated that they felt that SLP was very useful in their studies, 9 students (9%) stated that they felt that SLP was good but needed further improvement, 8 students (8%) stated that their experience was merely satisfactory, but it was not particularly helpful to them. In the following sections, we will go deeper into exploring the students' views about using SLP to support their learning.

3.1.1. The Functions the Students Used in the SLP Platform

The SLP educational platform has four major functions: assessment, learning reports, resources, and enhancement (adding reference here). We coded the students' responses in the survey and the interviews followed the four major functions, which are illustrated in Table 7.

Table 7. Functions used by the students in the SLP platform.

Functions	Quotes
(1) Assessment function	I often do the self-assessment, then I get instant feedback on my learning". (Sch2S4, 6 . . . Sch9S17)
(2) Learning reports	I check my learning report to identify my weak points and try to make improvements. (Sch3S6 . . . Sch9S18)
(3) Resources function with mini video lectures	I watched the mini video lectures, which helped to understand things better. (Sch1S2 . . . Sch9S17)
(4) Learning enhancement	I often watched some mini video lectures that were recommended by the platform to improve my learning. (Sch2S3 . . . Sch9S12, 13)

The results show that the most used function by students (46 students out of 98 student participants) was the resources function to find information and watch the mini lecture videos. One student stated:

"There are a lot of learning materials and resources which can support me in my study, such as, various assessments I can practice and many teaching videos I can watch."

(Sch8S9)

The assessment and learning reports functions were widely used by students (43 and 39 students, respectively, out of a total of 98 student participants).

"I do the assignments in the SLP platform which were given me by my own school teachers, and I can see my results right away in the learning reports. My school teachers also help me to understand and make improvement based on my assignment results."

(Sch3S8)

The learning enhancement function was also used by students (18 out of a total of 98 student participants). As one student stated:

"I learn many new things from those mini video lectures which might not be taught in the classroom."

(Sch5S2)

The data demonstrate that students used all the functions provided by the SLP platform. The resources, assessment, and learning report functions were most favored by students in supporting their studies.

3.1.2. The Best Experiences and Changes the Students Had

The students reported a number of best experiences when using SLP in their learning. The most often mentioned best experiences from students are listed in Table 8.

Table 8. The students' best experiences when using the SLP platform.

Best Experiences	Quotes
(1) Accessing to various assignment based on one's own needs or teachers' suggestions	I like the assessment tool and get instant feedbacks. (Sch2S12, 13, 16 . . . Sch9S5)
(2) Accessing a large number of mini-video lectures based on one's own needs or interests or teachers' and the platform's suggestions	I like to watch the mini video lectures in SLP very much. (Sch1S1 . . . Sch9S11)
(3) Enabling one to see one's own strong and weak points in one's studying through assessment and learning reports	The learning report tells me what I am good at and on which points I still need improvement. (Sch2S9 . . . Sch9S3)
(4) Receiving instant feedbacks	I like the instant feedback from the platform very much. (Sch2S4, 15 . . . Sch9S6)
(5) Free access, anytime, anywhere	The user interface could be improved. (Sch3S9 . . . Sch8S11, Sch7S14)

Based on the views they expressed, the students very much liked using the assessment tools to find out how well they were doing in their studies by means of instant feedback from the platform and their learning analysis reports. They could also access various mini video lectures based on their own needs or interests or suggestions from teachers and the platform. The online platform is free of charge for students and teachers, and they can use them anytime and anywhere. Free access is especially important for students and teachers in less advantaged places.

Many students reported that they experienced changes in their studies after used the SLP platform. The most often mentioned change was that their ways of learning were changed. The students improved their skills of how to learn, and they developed their own ways of learning.

Students stated:

"My ways of learning improved. Now I put more time into thinking and understanding. My perspective is widened. I become more active in my study. Before I was more concerned with memorizing content or information in my studies."

(Sch7S5)

"It (the SLP platform) changed my way of learning. Before I did not know how to improve my studying. I felt confused and blinded. Now I am clear of what I should work on and how to improve myself."

(Sch8S13)

"It helped me how to learn subjects systematically, I learned how to use a mind map. I became confident in learning new things. Before I was nervous when I had to learn new things."

(Sch3S10)

Several students also stated that they were more motivated in their learning, and they became more active and focused on their studies. They also said that they now have more options and possibilities in their studies.
Students stated:

"I become more active in my studies, I felt that I can influence my studying and take on my own responsibility for it, and I became more motivated."

(Sch1S1)

"It (the SLP platform) made me more active in my studies. My study interests increased. It expanded my ability to think and my ways of thinking."

(Sch2S8)

"I now have new ways to learn. I have become more focused and more active. I realized that I do not need to wait for teachers to teach me or to give me feedbacks. I can watch the mini video lectures online, and do the assignments with instant feedbacks. I can do so much learning by myself. My interest in learning has increased."

(Sch4S11)

Some students mentioned that using mobile phones, iPads, and computers make study more fun since many parents forbid their children from using electronic devices too much. With the availability of the SLP platform, they could use these devices for their studies, and they also became better at using electronic devices.

Only a few students out of the 98 student participants stated that using SLP brought about no change in their studies.

3.1.3. The Challenges and Improvement Suggestions the Students Had

There were also challenges associated with using SLP at school to support students' studies. The main challenges reported by the students are listed in Table 9.

Table 9. The main challenges of using the SLP platform based on the students' view.

Challenges	Quotes
(1) Too many frequent and mandatory SW updates from the platform	I did not like so many SW updates. Almost every time I logged in, it asked me to update (Sch2S4, 13 . . . Sch9S7, 14, 18)
(2) Slowness in opening the pages	It took me a long time to open the pages. Sometimes there was a long pause when I did my assessment. (Sch1S2 . . . Sch9S8)
(3) User interface was not particularly user friendly	I had difficulties in using it. How to use some functions was unclear to me. (Sch2S14)
(4) SLP contents needed improving.	Some teachers' voices in some mini video lectures were too quiet and unclear. (Sch4S3)
	There were too many test items in one test. (Sch8S9)

Based on the students' views, they felt it was troublesome that the platform had too frequent and mandatory updates, opening pages was slow, and the user interface was not especially user friendly. In addition to the technical issues of the platform, some students

also referred to the shortcomings of the contents in the platform. For example, some teachers' voices were too quiet and unclear in some mini-lecture videos, and there were too many test items in one test. The students expressed their wishes and suggestions for improvements in the SLP platform (see Table 10).

Table 10. The students' wishes and suggestions about improving the SLP platform.

Wishes and Suggestions	Quotes
(1) Fewer mandatory software (SW) updates from the platform	I wish to have fewer updates. There were too many updates from the platform. (Sch3S1,3,5 . . . Sch7S9)
(2) Improving network speed and faster opening of pages	Improving the network speed. It took a long time to open a new page. (Sch2S3,5, Sch3S7 . . . Sch8S16, Sch9S7)
(3) User-friendly interfaces	The user interface could be improved. (Sch3S9 . . . Sch8S11, Sch7S14)
(4) Optimizing the search function, adding picture search if it is possible	The search function could be improved. It would be good to have a picture search function. (Sch9S1)
(5) More various tests in the assessment tool	Some of the tests were too difficult for me. I did not like some tests. I wish to be able to choose from more tests. (Sch8S9)
(6) Adding more mini-video lectures,	I would like to have more mini-video lectures. (Sch2S2, 3, 6, Sch4S1 . . . Sch8S6)
and making the mini video lectures livelier and more attractive, and adding an assessment after each mini video lectures.	I felt that the mini video lectures were boring. It would be good to make them more attractive and fun to watch. (Sch8S12, Sch911) It would be good to do a test after watching the mini video lecture to see if I have learned the points from the video. (Sch8S3,13)
(7) Gamification mechanisms (such as gaming points and badges, ranking) in doing assignments	Using gaming points and badges, ranking when doing assessment would increase my interests and motivation. (Sch2S11, 12, 17, Sch5S1)
(8) Dedicated group chat for each subject, and deleting useless messages	I wish to have more discussion and interaction with other students in order to exchange ideas. I suggest having a chatting group for each subject and useless messages should be deleted. (Sch2S16)

The students' wishes and suggestions can be seen from three main perspectives. One is the technical aspect of the platform. Many students wanted fewer mandatory SW updates, faster connections, user-friendly interfaces, and better search functions. Another aspect is related to the contents of the platform. Some students wished to have more mini video lectures, an assessment after each video, and more variety in the assessment tool. The third aspect is related to students' interests and motivation. Some students wished to have high-quality and attractive mini video lectures, and gamification mechanisms, such as gaming points, badges, and ranking, in the assessment tool. Some students also called for more social interactions with other students. Overall, when designing or improving the SLP platform, it is important to think from the users' points of view.

As one student put it:

"When improving the SLP platform, please think from the students' point of view, try to understand the students' needs and how students' use the platform."

(Sch9S11)

3.2. The Teachers' Views about Using the AI-Aided SLP Educational Platform

In this section, we analyzed the responses from the 32 teacher participants, and present the results of the teachers' view about using the AI-aided SLP educational platform. All teacher participants stated that they felt that SLP was useful in their teaching. They described SLP as an additional teaching assistant or tool that could be used in aiding their teaching. Four teachers also expressed their view that there were difficulties with the

logging in, the slow connection, and some difficulties in using the SLP platform. The major functions used by teachers in SLP are illustrated in Table 7.

3.2.1. The Functions the Teachers Used in the SLP Platform

As mentioned earlier, the SLP educational platform has four major functions: assessment, learning reports, resources, and learning enhancement [12]. We coded teachers' responses in a survey and in interviews in accordance with these four major functions. The functions the teachers used in SLP are listed and explained in Table 11.

Table 11. The functions the teachers used in the SLP platform.

Functions	Quotes
(1) Assessment function	I used many tests in the assessment function either for the students' tests or used them as homework assignments. It is convenient to have the marking done automatically. (Sch8T3)
(2) Learning reports	I like the learning analysis report very much. It helped me greatly to see how well the students have learned and which parts I need to put more effort into my teaching. (Sch1T2)
	The student learning reports enabled me to provide personalized teaching. (Sch8T4)
(3) Resources function with mini video lecture	After my lectures at school, I recommend some relevant mini-lecture videos in SLP to the students to watch at home so that students can gain a better understanding of what was taught today in our lessons. (Sch7T3)
	I watch the mini video lectures to get some new ideas in my teaching, and I use some videos in my course. (Sch1T2)
(4) Learning enhancement	I often recommend them to my students to watch after school. (Sch1T1, Sch7T4, 6, Sch8T1, 2, Sch9T3)

The results show that most teachers used all the four functions of assessment, learning report, resource function, and learning enhancement function. Teachers used the assessment function for diagnostic assessment purposes, as tests during the course, or as homework assignments. Teachers could receive the learning reports of individual students as well as be given an idea of the situation of the whole class. They could provide personalized teaching or could adjust their teaching based on students' learning reports. Teachers suggested mini video lectures to students to watch after school, and they themselves looked at the mini lecture videos to improve their own teaching. They also used the videos for teaching in their courses. However, some teachers stated that they were not able to make full use of the functions. They would like to learn more about how to use the functions in the SLP platform. As one teacher put it:

"The SLP have quite a number of functions. I need to explore more how to use them in my teaching."

(Sch5T2)

3.2.2. The Best Experiences and Changes the Teachers Had

The teachers expressed various experiences using SLP in their work. The most often mentioned best experiences from teachers are given in Table 12.

Table 12. The teachers' best experiences of using the SLP platform.

Best Experiences	Quotes
(1) Having a better understanding of the students' learning situation based on their reports	I like the students' learning analysis reports. Through those reports, I can see how well the students were learning. I can provide individual support to students. (Sch7T1)
(2) Having various useful high-quality mini video lectures	There are so many mini video lectures in the SLP platform which were produced by top experts. These videos helped me greatly in my teaching. I used them in my lessons, and I also recommended them to my students to look at after my lessons. (Sch8T3)
(3) Using assessment tools for tests and homework assignments with automatic marking	I often use assessment tools for a quick diagnostic assessment of the students' learning. I can see right away what part the students learned well, and which part still needed improvement. (Sch9T2) I used the test items in the assessment tool for students' homework. (Sch5T1)

Based on the teachers' views, they had very positive experiences of using SLP in the following three areas. First of all, teachers stated that they had a better understanding of their students' learning situations based on the students' learning analysis reports. This helped teachers greatly to gain a quick and clear understanding of each individual student's, as well as the whole class's, learning situation. Based on the learning reports, teachers provided personalized support to students and also adjusted their teaching according to the students' needs and levels. Second, the mini video lectures in the SLP helped the teachers' work a great deal. Teachers can watch the mini video lectures to improve their own teaching, use them in their lessons, or recommend them to students for further study after the lessons at school. Third, teachers stated that they used assessment tools in SLP for diagnostic purposes as well as used them as homework assignments. Teachers enjoyed the fact that the SLP platform has the automatic marking in assessment function that reduced teachers' workload. Some teachers also commented that sometimes they could not find the materials they needed from the SLP platform.

Many teachers stated that they made changes in their teaching after using the SLP platform. The most often mentioned changes by the teachers were that they were able to provide personalized support to students.

Here are the comments of two teachers:

"From students' learning reports, I can clearly see at what points students have learning difficulties, so that I put more effort into these points. I also pay more attention and give more support to those students who have difficulties in learning."

(Sch6T2)

"It (the SLP platform) helped me a lot in my lesson preparation."

(Sch9T1)

Several teachers also stated that the SLP platform reduced their workload in the assessment part so that they had more time to support students in need.

One teacher stated:

"The platform contains the assessment and provides students' learning report. This saves me a lot of time. Before using the SLP platform, I had to assess the students' homework assignments and exams which took up a lot of my time. Now the platform does it automatically. I have more time for other things."

(Sch1T2)

Only one teacher stated that using SLP brought about no changes in their work. Two teachers said that they felt that some students became more active in their learning. They reported that some students were watching the mini video lectures prior to the lessons.

3.2.3. The Teachers' Challenges and Suggestions for Improvement

There were also challenges for the teachers when using SLP in their work at school. The major challenges reported by the teachers were listed in Table 13.

Table 13. The challenges of using the SLP platform based on the teachers' view.

Challenges	Quotes
(1) Not all students have adequate electronic devices	"Students need iPads or mobile phones to use the SLP platform. Not all students have adequate electronic devices. It would be good if every student could have an iPad to use during the lessons at school."
(2) Having difficulties in user interfaces, functions, etc.	The user interfaces were not very friendly to use. (Sch1T1, Sch7T6) The search function is not very good. (Sch8T2)
(3) Needing more specific test items in assessment based on the local teachers' needs	I spent lots of time searching and re-organizing the test items based on our students' needs. (Sch7T1) Some test items were not suitable for our schools. I would like to have more test items based on our local school needs. (SchT3)
(4) Needing more specific mini video lectures based on the local teachers' needs	"Quite a few mini video lectures used different teaching materials. It would be good to have those videos that are based on our own teaching materials. It would be good that we could also add our teaching videos for our students." (Sch1T1)

Based on the teachers' views, it was felt that there were three major challenges. One important challenge was that not all students had adequate electronic devices to use with the SLP platform. Some students only had old mobile phones that were very difficult to use with the platform. The second major challenge was related to the platform's interfaces and functions. Some features of the platforms were not good, such as login difficulties, the interfaces were not user friendly, the searching function was not very good, and there were difficulties when putting in some special symbols or signs. The third main challenge was related to the contents (test items in the assessment function and mini video lectures in the resource function) of the platform. Teachers felt that some test items in the assessment were not suitable for the teachers' needs, and a greater variety of assessment items was needed. They also needed more mini video lectures based on their local teaching materials and needs. It seems that the biggest challenge was the availability of adequate electronic devices for students to use the SLP platform. Not all students from the participating schools had suitable electronic devices either at the school or at home because of the financial situation of the family. This challenge was mentioned by several teachers.

The teachers expressed their wishes and suggestions for improvements in the SLP platform (see Table 14).

Table 14. The teachers' wishes and suggestions for improvements in the SLP platform.

Wishes and Suggestions	Quotes
(1) An adequate electronic device for each student at school	Some students' mobile phones are too old. It would be good that each student could have an iPad to use at school. (Sch7T6)
(2) Better user interface and more features	I wish it is easier to use and find information.
- Downloading and uploading features	I want to download videos from the platform or upload my video lecture for my students. (Sch5T2)
- Chatting room feature for teachers to exchange teaching ideas and information	We teachers also need to exchange information and teaching experience with other teachers. It would be good to have a teachers' chatting group. (Sch9T2)
- Gamification mechanism features	It would be good if students were motivated when using the SLP, as they played computer games. (Sch5T1)
(3) Greater variety of tests in the assessment tool and more mini video lectures in the resource function	I wish to have more tests and mini video lectures based on our local teaching materials. (Sch8T3)
(4) Training on SLP for teachers	I am not too sure how to use some functions in SLP. I would like to get some training on how to use SLP. (Sch1T2)

Based on the teachers' views, their wishes and suggestions were from four main areas. One was the availability of adequate electronic devices for students to access the platform. The teachers wished that their school could provide every student with an iPad. Another request from teachers was related to the technical aspect of the platform. They wanted a better user interface and more features in the SLP platform. They suggested the following: have the ability to add their own teaching videos to the platform for their students' use; have their own interactive groups; be able to download and upload videos; and have gamification mechanisms (such as gaming points and badges) to motivate students' learning. The third suggestion is related to the contents of the platform. Teachers wanted to have more mini video lectures and a greater variety of tests in the assessment tools; and they requested mini video lectures and assessment items related to local used teaching materials. Last but not the least, teachers also expressed the wish to have some training on how to use the SLP platform for teachers.

4. Discussion

This study aimed to investigate in what ways the AI-aided SLP educational platform supported teaching and learning in Chinese schools based on teachers' and students' views. We used a content analysis method to examine 98 students' and 32 teachers' feedback and experiences from 9 Chinese schools that used the SLP platform. In this section, we discuss the main findings from this study.

Based on the students' and teachers' views, the findings demonstrated that this AI-aided SLP educational platform was a useful tool that can support students' learning and teachers' work in Chinese schools. This study finding confirms earlier studies that AI technology provides more options and supports learning and teaching [9,10].

Our study sheds light on what teachers' and students' views were on using the AI-aided SLP educational platform in Chinese schools. Among the four functions of SLP [12], both teachers and students greatly appreciated the functions of assessment, learning analysis reports, and resource centers with mini video lectures, and they also used the enhancement function to some extent. This is also confirmed with the earlier study [12]. Almost all teachers and students, apart from a few of them, reported that the SLP was useful for them, and the SLP introduced changes in teachers' work and students' studies. The findings indicate that the AI technology-based online education platform can assist in teachers' work and students' learning by acting as a teaching assistant [12,13]. This AI-aided SLP platform provides new ways and opportunities for learning and teaching with additional tools and resources both for teachers and students [12], as well as positive experiences and changes [12], especially for schools in less developed areas that need high-quality education teaching resources and where teachers have a heavy workload.

With the AI technology used in the SLP platform, students were able to see their learning analysis reports and receive recommendations according to their individual needs for further improvement. With a large range of mini video lectures, students can actively study at their own pace by themselves based on their own needs and their interests. Teachers were able to gain a better understanding of individual students' needs as well as the whole class' learning situation so that they could provide personalized teaching and adjust their teaching according to the students' needs. With assessment tools, students can utilize self-assessment and teachers can use them as for diagnosis assessment purposes, as well as for students' assignments. The teachers' workload in assessing the students' assignments was also greatly reduced because of the automatic marking function in the SLP platform.

However, there were also challenges associated with the use of the SLP platform. The biggest challenge was the lack of adequate electronic devices for students to use the SLP platform in Chinese schools that were situated in less advantaged areas. The local educational bureau or government needs to provide more financial support to schools that need electronic devices. A user-friendly user interface and additional features in the platform are also important for teachers and students. In addition, both the teachers and

students proposed that gamification mechanisms should be implemented in the platform to increase the students' motivation and interests. Additional resources and assessment items are needed for local schools. Both teachers and students expressed the need for social interaction chatting groups. Teachers wished to discuss with other teachers and exchange information and experience about their teaching, and students wished to interact and discuss their learning experiences with other students. It would be good to provide some training for both teachers and students on how to fully utilize the functions in the platform.

The implication of this study is that AI-aided online educational platforms are useful tools for supporting teachers' work and students' learning. The platforms supply the functions and resources of additional teaching assistants. They provide more possibilities and options for quality education resources to teachers and students, especially for schools situated in less advantaged places. According to our study, Chinese schools in less developed areas need more support to provide adequate electronic devices for students who have economic difficulties. Both teachers and students requested user-friendly user interfaces and features, social interaction aspects, motivational gamification mechanisms, and meeting the local school's needs. When introducing AI educational platforms, both students' and teachers' needs should be taken into consideration.

5. Conclusions and Implications

It was our aim to explore how the AI-aided educational platform was used by teachers and students and what their views and experiences of using the SLP platform were. To achieve this aim, we used a content analysis method to investigate the feedback from 98 students and 32 teachers from 9 Chinese lower secondary Chinese schools. The main finding demonstrated that the AI-aided SLP platform can greatly support students' learning and teachers' work. Students can carry out self-assessment, see their learning reports, and watch mini-lecture videos based on their own needs and interests. Students became more active in their learning since they had the freedom to access the resources in the platform in accordance with their own choices and at their own pace. Teachers' work become easier with some ready mini video lectures and assessment materials, allowing them to provide more personalized teaching and better meet the students' needs based on the information received from the students' learning analysis reports. However, improvements are needed for adequate electronic devices, user-friendly user interface, and meeting the local school needs. Training on how to use the platforms to achieve the best results is also important for teachers and students. This is especially needed for Chinese schools in less advantaged areas. Teachers and students also requested platform features with social aspects, such as interactive chat groups. With this study, we contribute to the research of how to use technology for supporting teaching and learning. The study introduced new insights into users' needs in the AI-aided educational platform based on the students' and teacher's experiences and perspectives. We conclude that according to the teachers' and students' views, the AI-aided SLP educational platform is useful in providing additional support and resources for teachers' work and students' learning, although further improvements are needed, especially for schools in less advantaged areas. For future research, we will include the students' learning results to provide evidence on how the AI-aided SLP educational platform supported the students' learning.

6. Patents

The name "Smart Learning Partner" is used for this AI-aided educational platform, which is developed and provided by the Advanced Innovation Center for Future Education at Beijing Normal University.

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