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Teacher Experience of Integrating Tablets in One-to-One Environments: Implications for Orchestrating Learning

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Abstract: We investigated teachers' perceptions and behaviors regarding the integration of tablets into their activities in the one-to-one classroom. The use of tablets in classroom instruction can enrich the pedagogical quality of students' collaborative activities, enhance classroom engagement, and facilitate various classroom activities. Seven focus group interviews were conducted with 37 teachers from seven rural public schools in Korea. Data were mostly generated using semi-structured interviews and were then analyzed using content analysis. Our results show that teachers made efforts to incorporate various interactive activities into the classroom using tablets. With technology tailored to one-to-one environments, interactive instruction was based on teachers' perceptions of the unique advantages of the tablets and relevant technologies. The teachers reported that instruction using one-to-one technology could enhance each student's engagement. However, the teachers faced multiple challenges in using tablets in terms of meeting their instructional objectives or teaching goals in the context of classroom teaching. In tablet-integrated classes, the teachers reported curriculum completion issues and the need for a longer period of teacher training before tablet integration. This study is valuable because few studies discuss the role of teachers with regard to their pedagogical experiences with tablet-integrated classrooms in the context of one-to-one computing activities.

Keywords: teaching and training; mobile communication; technology integration; technology uses

1. Introduction

The use of information technology in education has the potential to change the boundaries of classrooms in traditional schools and classrooms [1,2]. As an instructional technology that is expanding rapidly, the use of tablets in classroom instruction can enrich students' interactive and collaborative activities, enhance classroom engagement, and assist in a variety of instructional contents and applications for learning and teaching [3–7]. Additionally, educational tablet use can lead to advances in the interactivity of the educational process between teachers and students or among students. Thus, instructional activities using one-to-one tablets have been designed for more interactive, student-focused instruction than the traditional method of classroom instruction [8]. Recently, we have observed a technology-based transformation in the way teachers teach and students learn in schools; for example, students are receiving personalized support focused on their interests and needs, teachers are supporting individual students in class, advanced learning tools such as simulations and personalized practices are available, and classroom activities may be led by external experts or other students [6,9,10].

However, classroom instruction that integrates tablets and relevant technologies is associated with some pedagogical difficulties [11], although such instruction can have multiple advantages. The increasing popularity of tablet technology creates greater potential for classroom activities using a student-centered approach that emphasizes collaborative methods and active involvement of the learner compared with when personal desktop computers are used as the classroom technology [8]. Despite these advantages, innovative technologies for classroom instruction tend to face the typical obstacles of integration into the classroom and other challenges. Technology-integrated instruction is often hindered by limits such as the curriculum schedule, class duration, the number of students in a class, activity space, teacher competency, and student readiness to adopt the technology [12,13]. In addition to these typical obstacles, the characteristics of tablets may cause additional challenges during instruction that aims to integrate tablets into the classroom for a student-centered approach.

Tablets have unique advantages in terms of mobility, multifunctionality, and interconnectivity for creating one-to-one computing environments for students [14,15]. First, the tablet's mobility expands the physical boundaries for learning and allows students to engage with learning materials using a wide range of apps and connectivity anywhere, not just in the classroom [16]. The mobility of these devices allows a wider range of learning activities than that which routinely occurs in the classroom [17]; for example, learning can be moved to other locations, such as outdoors, where learners can engage in activities using a tablet. Second, multifunctionality, a key characteristic of tablets, provides various functionalities and services, including educational apps, multimedia apps, a digital camera, mobile Internet access, communication, music players, learning management systems, and cloud storage. These features provide flexible and personalized support for students based on their needs [15]. Third, a tablet-integrated classroom offers greater access to a more widely distributed social intelligence [18] when students are able to communicate with peers and experts or to exchange information [19]. Teachers in these classrooms can facilitate their students' use of tablets in various learning activities. These characteristics of tablets in relation to classroom use are helping to transform the instructional paradigm from a teacher-centered approach to a student-centered approach, which can encourage both teachers and students to engage actively in instruction [20]. To accomplish this technology-based transformation in the classroom, the teacher's role and behavior in using such technology to support students' learning is important [2,7].

2. Literature Review

The tablet is an educational tool for supporting interactive activities in the classroom, where the major advantages of technology application are providing interaction and enriched learning resources. The evolution of information and communication technology (ICT) has contributed to the diffusion of technology-supported interaction in classroom instruction. Various types of classroom interactions use ICT that is based on providing structures for interaction [21], including class interaction, group interaction, individual interaction, and interaction with ICT. These interactions create enhanced opportunities for learning and challenges through certain teaching methods, and such opportunities are important in classroom interaction because they can improve learning engagement and achievement of both teachers and students. Technology-based pedagogical interaction can produce positive results when goals are set for its use, teachers are prepared, and students are engaged and motivated to learn [22,23].

The success of technology-mediated interaction in classroom teaching depends on the effectiveness of appropriate pedagogical interactivity activities for achieving instructional goals that are mediated by the technology. Pedagogical interactivity activities are designed to stimulate learning by encouraging reciprocity between a student and others in the classroom [24]. Pedagogical interactions in the classroom actively occur during student engagement (raising hands, responding, providing demonstrations, offering questions and answers, providing help) and teacher feedback (praise, feedback, positive contact, number of questions). Such interaction is positively related to student achievement and student satisfaction [25]. Pedagogical interaction integrated with technologies is reported to promote a more active learning environment, facilitate the building of learning communities, provide greater feedback for lecturers,

and improve student motivation [26]. As a key to promoting students' learning, interactivity is related to the teacher's ability to respond contingently to the learners' actions [27]. In technology-integrated classroom instruction, pedagogic interactivity and related activities have an important impact on the quality of learning [28] compared with technological interactivity, which emphasizes physical interaction with the device.

Pedagogical success in integrating classroom interactive technologies (e.g., interactive whiteboards or tablets) is highly dependent on the role of the teacher because in class instruction, teachers are the most important component for enhancing pedagogical interactivity rather than technical interactivity [29]. Teachers can determine how to use interaction in the classroom based on their pedagogical goals and instructional strategies. Their role in tablet-integrated classrooms is similar to their role in classroom instruction using typical technology integration. However, to create one-to-one computing environments, the multifunctionality and personalization of tablets can present fairly different issues than typical technology and may need additional considerations because the success of this environment depends not on technology knowledge or skills but on integrating technology with the curriculum using the personalized functionalities of tablets. Currently, the average teacher-to-student ratio is still one teacher to many students, which can limit a teacher's ability to focus on individual students' interests and progress and to increase their engagement in learning. Student disengagement in public schools has been an issue related to academic achievement and satisfaction because of the large numbers of students in limited classroom spaces and because of curricular, socioeconomic, and sociocultural factors [30,31]. Tablets can increase students' engagement in the context of one-to-one computing classes and can create a more student-centered environment compared with regular classrooms [32].

The goal of the study is to address current gaps by examining teachers' pedagogical experiences with interactive instruction using one-to-one technology from the aspects of positive and negative experiences. Although pedagogical success with interactive technologies in the classroom depends greatly on the role of the teacher, relevant studies focus on a student-centered approach when assessing the effect of innovative treatment using the technology. We present the study's background based on teachers' behaviors and perceptions in relation to tablet-integrated instruction and their challenges in engaging students through instruction. Based on the teachers' opinions, we discuss the role of teachers in student learning in the interactive classroom. Depending on the goal, the following research questions direct the study: (1) What are teachers' experiences in interactive classrooms that use tablets for one-to-one computing and other relevant technologies in classroom teaching? (2) What are the obstacles and challenges in engaging students with tablet integration? (3) What are the important aspects of technological integration in the context of one-to-one computing classes?

3. Context of the Study

The study context is an ongoing project dedicated to renovating traditional classrooms in rural schools to tablet-based classrooms, that is, technology-enhanced classrooms that provide one-to-one computing environments by integrating learning technology with sustainable support to advance e-learning in schools. The tablets and other technological equipment were donated to the schools by a Korean corporation starting in 2012. The goal of the project is to support technology-based learning environments for poor, rural schools and to create sustainable technology competencies for teachers and students. Tablet-based interactive classrooms, also called Smart School, include an interactive whiteboard with multiple input tools (e.g., a camera, digital visualizer, microphone, and student tablets), tablets for each student and teacher, an interaction management system to link the interactive whiteboard and tablets, and high-speed wireless Internet access. Students and teachers can share and transfer instructional materials or multimedia files in synchronous ways using the interaction management system.

The characteristics of tablet-based interactive classrooms can support teachers' imagination and students' engagement without causing alienation during instruction. Evolving mobile technologies such as tablets have added to the range of collaborative possibilities in classroom instruction, introducing seamless personalized learning [4,33], more advanced interactivity between teachers and students or students and

other students, and a wide variety of instructional contents and applications. Teachers in a previous study reported their classroom teaching activities and pedagogic approaches for one year through online surveys and focus group interviews. Students also engaged in the tablet-based interactive classroom by showing friends their work, participating in class activities and group activities, taking pictures or making movies, solving math problems, editing picture or movie files, and reading e-textbooks or e-books [34].

The overall goal of the project was to enrich the learning environment and increase learning experiences in poorly performing rural schools. However, at the beginning of the project (i.e., in the first year, 2012), schools were selected based solely on their location in rural areas; in the following years, 2013–2014, they were selected because teachers in rural areas who were familiar with technology integration applied to be included. At that time, the project did not emphasize professional development to improve the teachers' competency in technology integration for one-to-one computing for student-centered activities. Thus, it was necessary to examine how teachers perceived the technology-integrated tablets and relevant technologies in their classrooms.

3.1. Research Design and Methods

This study used a qualitative research design with data obtained from focus group interviews with teachers in each school [35]. Teachers' background information and experiences with technology were examined. We visited the schools and conducted interviews in the classrooms or teachers' offices. Semi-structured interviews were mainly conducted in each school and subsequently analyzed. Both researchers from the project team undertook all of the interviews with teachers to ensure consistency. Two researchers in the study conducted interviews with all of the teachers, who participated voluntarily with the consent of school administrators. The teachers who participated in the project were asked about their interactive activities and behaviors in tablet-based interactive classrooms that are part of the Smart Schools program, which is supported by a corporate responsibility initiative. All teachers at schools involved in the project were selected for and undertook semi-structured interviews after being granted permission from the principals.

3.2. Participants

Teachers at seven schools participated in interviews to examine the overall application, barriers, advantages, and classroom management of smart classrooms in rural schools for one month in November 2014. Thirty-seven primary school teachers from rural public schools in South Korea were involved in the focus groups. There were 14 (37.8%) female and 23 (62.2%) male participants. Of them, were 5.4% were between 20 and 25 years old, 24.3% were between 26 and 30 years old, 21.6% between 31 and 35 years old, 29.8% between 36 and 40 years old, 13.5% between 41 and 45 years old, and 5.4% were 46 years or older. Participants' information and communication technology user levels were 16.2% novice (n = 6), 37.8% intermediate (n = 14), and 46.0% advanced (n = 17) (see Table 1).

Table 1. Participants' demographic data

Demographic Information		Frequency (n = 37)	%
Gender	Female	14	37.8%
	Male	23	62.2%
Age	20–25	2	5.4%
	26–30	9	24.3%
	31–35	8	21.6%
	36–40	11	29.8%
	41–45	5	13.5%
	Over 46	2	5.4%
ICT proficiency	Novice	6	16.2%
	Intermediate	14	37.8%
	Expert	17	46.0%

3.3. Interview Themes

The major interview themes were as follows: (1) How do the teachers perceive interactive activities using tablets and relevant technologies in classroom teaching (e.g., in terms of appropriate interactive activities for a class, pressure to use interactive activities in a smart classroom environment)? (2) What kinds of teacher–student interactive activities using tablets and relevant technologies were performed last year in your classroom (e.g., class interaction, group interaction, individual interaction, interaction with ICT; describe the classroom activities for which you used the tablet-based interactive system and those for which you expect to)? (3) What are the teachers' pedagogical experiences using tablets in classroom teaching in a one-to-one classroom? In addition, open-ended questions examined teaching and learning in a smart classroom, examples of actual instruction, advantages or disadvantages of a smart classroom, effective activities, barriers, and other issues.

3.4. Analysis

All interviews were recorded for analysis by the research team. In this context, the interviews were intended to build grounded themes based on grounded theory [36]. To analyze the interview data of the current research [37], the following steps were adopted: (1) transcribing; (2) data coding; and (3) memo writing, translating, and inter-coder checking. After identifying prominent themes from the initial transcripts, the emerging categories were adopted and the themes were extended with complementary analysis. The transcripts were reviewed repeatedly. The reviewed transcripts were applied and developed to identify significant themes across interviews. To identify generic themes, the transcripts were categorized according to the themes that emerged from the material based on a grounded analytical approach. After this, an additional round of analysis was conducted, in which special attention was given to whether the focus of practices and/or verbal statements was on (1) interactive approaches in the classroom; or (2) teachers' experiences in which the technology was supportive. The material was analyzed to reveal whether categories and foci of practices and/or verbal statements were evident over time. When analyzing the material, special attention was focused on the four aspects mentioned earlier. The study's three major themes—including interactive activities, teacher–student interactive activities, and teachers' pedagogical experiences using tablets and relevant technologies—provided the researchers with a constant flow of data for analysis. After coding the interview data, the researchers brought similar ideas that emerged from the material and sorted the ideas with memos. All categorization was given titles after inter-coder agreement.

4. Results

The demographic characteristics of the subjects interviewed are 62.2% male and 37.8% female. Teaching experience varied from 1 to 22 years, with an average of 8.2 years, and 83.7% of the teachers thought that they had at least an intermediate level of technology use, including 45.9% who reported an advanced level. Additionally, 78.3% thought that they had at least an intermediate level of knowledge of tablet technology (40.5% reported an advanced level). Of the teachers in this study, 89.2% had participated in formal in-service training programs on classroom management or related topics, such as interaction management solutions, digital textbooks, application installation and use in classrooms, and instructional design for tablet-integrated teaching. Most of the teachers in charge of tablet-based interactive classrooms had been given various opportunities to attend the teacher training program that was supported by the donor company.

From the data analysis, multiple themes on the teachers' adoption of tablet-integrated instruction emerged. These are presented as four major themes in Table 2 and include interactive instruction using tablets, engaging and struggling to support individual needs, fluent integration of technology and curriculum, and needs according to class size.

Table 2. Emergent themes from teachers' interviews

Main theme	Subthemes
Theme 1: Interactive instruction using tablets	1.1 Understanding tablet characteristics 1.2 Expandable range of instructional material 1.3 Teachers' feedback to students 1.4 Students' group activities
Theme 2: Engaging and struggling to support individual needs	2.1 Enhancing students' engagement 2.2 Teachers' decisions on objectives and instructional approach 2.3 Managing the interactive classroom 2.4 Challenges related to technological fluency 2.5 Individual learning needs and technology 2.6 Teachers' responsibilities for students
Theme 3: Fluent integration of technology and curriculum	3.1 Use of technology in short class times 3.2 Need time to achieve fluency 3.3 Use of technology to meet instructional objectives 3.4 Use of technology to meet the requirements of the national curriculum
Theme 4: Needs according to class size	4.1 Communication needs 4.2 One-to-one technology

4.1. Interactive Instruction Using Tablets (Theme 1)

With technology for one-to-one environments, teachers have the potential to exploit a wide range of pedagogical interactivity opportunities, and effective teaching will incorporate a variety of levels of interactivity within and between lessons, depending on the learning objective [38]. Burns and Myhill [39] characterized effective interactive lessons as those that provide reciprocal opportunities for talk that allow children to develop independent voices in discussions, provide appropriate guidance and modeling when the teacher orchestrates the language and skills for thinking collectively, create environments that are conducive to pupil participation, and increase the level of pupil autonomy.

The teachers in the study described their various pedagogical activities in the classroom, such as sharing and saving learning artifacts or outcomes through the interaction solution and tablets. These activities were based on teachers' perceptions of the unique advantages of the tablets and relevant technologies—including mobility, multifunctionality, and interconnectivity—which allowed the teachers and students to promptly share their materials in the classroom.

> Students shared their investigations into the problem or issues in the social studies class using tablets and interaction apps between the tablets and electronic whiteboard. It was not necessary to give them homework or to visit a computer lab to investigate them. We could take the immediate moment to examine them and to discuss them. After searching movie clips or photos by individual students, we could share them at the appropriate point in the lesson. My instruction seems to be more smoothly linked with the next phase of the lesson. (Teacher Cho, N. School)

Teachers mentioned trying to find instructional ways to support pedagogical and interactive activities for each student to meet their lesson objectives. Specifically, the teachers described the use of tablets for pedagogical and interactive activities in the one-to-one environment. First, in the smart classroom, students tend to work with paper-based worksheets or other materials during personal or collaborative classroom activities, but tablets and the interactive solution can create extended resources, such as digital textbooks and relevant clips, teacher-created electronic files, or multimedia sources. The teachers commented that students could download or follow links to view the materials. Second, the teachers described their experience with using tablets for their classroom teaching and to provide feedback. During limited class hours, students could receive the teacher's and their peers' feedback on their work. Students also received the teacher's feedback in traditional ways, but the teachers reported that when they used the tablets for personal learning activities, they needed to monitor the students' work. However, this did not occur every day during classroom activities. Third, the teachers adopted tablets for the students' group activities. Tablets can make group activities

easier through group support apps or web services. Finally, in a traditional classroom, students' artifacts from instruction are not stored in a learning management system or a virtual team community, but the tablets made it possible for individual students to promote the management of group activities. Some of the teachers used a popular Korean social networking service for classroom management or class work, Classting. Beauchamp [40] reported similar findings that teachers perceived the possibilities of tablet-based classroom activities for creating personalized and collaborative learning environments that can promote students' engagement in classroom teaching.

4.2. Engaging and Struggling to Support Individual Needs (Theme 2)

When using tablets for classroom teaching, the teachers reported that instruction in a tablet-based classroom can enhance each student's engagement through the tools and pedagogical activities. Traditional teacher-centered instructions in class tend to be weak in terms of supporting all students' engagement in a class activity based on individual needs and levels. A teacher in an elementary school responded:

> It (the smart classroom) caused students to participate in class activities more than before. When I asked their opinions and presented their outcomes in class, they didn't do well, even though I gave them all opportunities. For example, now students are trying to use the tablet to arrange their presentations and present their thoughts through the system (the interactive whiteboard and tablet). (Teacher Hong, S. School)

Most of the teachers agreed that the success of such activities in the one-to-one classroom depends on the instructional objectives and pedagogical decisions that the teachers themselves make. At the beginning of integration, it is necessary to provide technology training to increase student engagement, particularly for low-performing students. Additionally, the teachers reported that technology helped to increase the motivation of students who previously had low motivation in classroom learning. One teacher said:

> A student with low-motivation who is addicted to computer games did not engage in class lessons well before. However, the student was well engaged with the classroom use of tablets and actively participated in the classroom activities. (Teacher Moon, B. School)

The teachers said that they had difficulty managing the class and the students' engagement even when using the management system. The teachers responded that when students used tablets to work on individual activities, the teacher tended to struggle to manage all the students in the classroom. It may be that teachers did not have effective strategies for orchestrating the interactive classroom setting to achieve instructional goals by working on individual activities using apps or other technology. The respondents were accustomed to traditional methods of classroom teaching, and some felt uncomfortable using tablets to implement an interactive classroom environment that focused on students' individual activities. Along with challenges related to technological fluency, the teachers felt the difficulty of developing differentiated contents or levels when they adopted tablets for individual learning activities. A teacher said:

> Tablet adoption for individual needs is good for some subject matter, for example, mathematics. For me, I adopted a math app and a math item bank for the students' math level and needs. For this tablet-integrated activity, I had to develop customized math tasks and progress-based evaluations to determine the individual students' level of understanding and diagnosis. However, it is not easy, and I had to expend much time and effort. (Teacher Kim, C. School)

The teachers rarely accomplished authentic personalized learning using tablets even though they had done so in the regular classroom, which supports the need for instructional support for using tablets to individualize teaching to different needs and levels. The teachers, particularly novice and senior teachers, felt inconvenienced by the tablet-integrated classroom because they were not fluent in

tablet use and management. Additionally, teachers with more teaching experience tended to think it was possible to teach students without using the latest or any relevant technologies. Interestingly, those with longer experience also thought that innovative technologies could enrich people's practical and future lives. Thus, the teachers felt a responsibility to develop professionally in the effort to enhance their competencies regarding using tablets to individualize their instruction for each student.

4.3. Fluent Integration of Technology and Curriculum (Theme 3)

Interestingly, we could identify the external factors related to the disturbance the teachers experienced when they integrated tablets into the one-to-one classroom. The teachers faced some obstacles to adopting tablet activities, such as the need to meet instructional objectives, the requirements of the national curriculum, short class times, and a deficit of professional competency for technology integration. Several of the teachers described their difficulties with integrating technology into the classroom to meet instructional objectives. A teacher said:

> In teacher training for tablet integration, it is necessary to observe instruction in an actual classroom with tablet integration or a case presentation to quickly apply to our teaching activities. Additionally, teacher training should be planned after or before class for teachers to provide enough time to learn and practice. (Teacher Kim, N. School)

More than integrating computers or laptop computers, teachers may need enough time to develop their professional competency for technology integration, particularly for designing lessons with tablets. The active adoption of digital technologies for instruction relies on teachers' decisions regarding the convenience and availability of technologies that improve their instruction [34]. To make better instructional decisions using tablets, teachers need to experience the unique advantages of mobility, multifunctionality, and interconnectivity through specific examples in the context of classroom teaching. Technology integration with tablets requires an approach that differs from teachers' actual practices in technology integration, including lesson design and lesson implementation, because teachers need to be fluent enough to design lessons and implement them [29].

Teachers and students need time to achieve fluency in the use of technology during short class periods. To lead more complex activities using tablets (e.g., concept mapping or creating news clips), many teachers reported rearranging two class sessions for tablet-integrated instruction. One teacher said,

> ... Our students have to learn a relatively high number of curriculum and subject contents. Typically, it is so tight to complete the intended instructional activities within limited class hours. For me, this is the most difficult part of tablet integration. If it is possible, it may be necessary to increase class hours or decrease the curriculum to complete successful technology integration ... (Teacher Choi, M. School)

Regular elementary school in Korea, which consists of a teacher and many students in a classroom for a short period of instruction, i.e., 40 minutes, has limits. The amount of class time available to meet instructional objectives is limited, and teachers are required to proceed through the national curriculum for each subject. Some of the teachers who participated in the interviews reported that they had trouble with limited, short periods of instruction and tight curriculum management. Within these limited environments, teachers who have experience with using technologies in daily life seem to have less difficulty using and managing tablets as part of their instruction. Teachers also tend to actively try to include technology integration ideas in their instruction. Thus, teachers may need to gain experience through as much as one year of teacher training in one-to-one environments using tablets and relevant technologies to be able to naturally incorporate tablet-based one-to-one instruction.

4.4. Needs According to Class Size (Theme 4)

Tablet-integrated one-to-one environments may have a greater influence in medium-sized or larger classrooms, i.e., those with more than 10 students. This project focused on rural schools and

students in underprivileged areas. Typically, schools in underprivileged areas have small numbers of students in their classrooms. Teachers in small (fewer than 10 students) and medium (fewer than 20 students) classrooms reported different communication needs among their students in various classroom activities. A teacher of a medium-sized class noted:

> ... As we know, there are multiple ways to solve math problems rather than only one solution. We used tablets' basic notes to solve problems and monitored them through the management solution. We opened each student's solving process on the interactive whiteboard to review them. It was really good feedback to each student regarding solving math problems in the classroom ... (Teacher Ma, B. School)

However, a teacher of a small class noted:

> ... Our classroom consists of 8 students. We don't have the individual support issues of a regular large classroom. The functions of tablets for enhancing classroom activities are not that necessary. In the large classroom, there are different needs, unlike in our small classroom. It is not easy to listen to many students' needs and opinions during instruction; only some students can have a chance to speak and share their thoughts in the limited class hours ... (Teacher Lee, M. School)

The teachers in these classrooms performed various instructional activities by integrating tablets. Although they emphasized the importance of interactive classroom activities, they responded differently in that teachers of smaller classes were less likely to emphasize the function of individual activities using one-to-one technology. This finding shows that pedagogical activities using tablets and relevant technologies need to be applied differently based on class size in a classroom teaching context.

5. Discussion

In this study, we focused on teachers' perceptions of the pedagogical experiences of tablet-integrated classrooms in the context of one-to-one computing activities. In classroom teaching, tablets offer unique advantages in terms of mobility, multifunctionality, and interconnectivity, leading to advances in instructional activities between teachers and students or among students. The teachers responded that various classroom activities using tablets included motivating students, investigating problems, searching for information, watching movie clips, and using concept mapping to increase student engagement in one-to-one classrooms. Students in tablet-integrated classes can expand their learning environments from a classroom to outdoor or virtual spaces, receive personalized support focused on their interests and needs using advanced learning tools, and engage in communication activities led by external experts or students at foreign schools. It is necessary to examine how teachers perceive and experience the pedagogical challenges of tablet integration in the one-to-one classroom environment, because the teacher's role in classroom teaching using tablets and relevant technologies is important for implementing effective pedagogical activities.

The overall inference of the present study is that the use of tablets and relevant technologies has recently become popular in classrooms to enhance learning experiences as discussed in the Introduction and Literature review sections. Although educators have positive expectations for the tablet-integrated classroom, they show somewhat mixed responses, such as adoption, pending adoption, or refusal to actively adopt the technologies. This is similar to Ferguson and Oigara's [11] findings regarding teachers' mixed responses regarding the effects of tablet use on the teaching-learning process and student behaviors. This study aimed to explore teachers' perceptions and challenges as well as factors that drive success in interactive classroom teaching using tablets. Technology in the classroom can produce positive results when goals are set for its use, teachers are prepared, and students are engaged and motivated to learn [22,23]. Most importantly, teachers need to design appropriate pedagogic activities in the one-to-one classroom to achieve instructional objectives and ensure that students are learning; they should avoid activities that are too interactive or not interactive enough. To this end,

teachers using technology to manage class activities must learn new approaches to design lessons and interact with the students and their technologies [41].

Teachers tend to experience some overload in tablet-integrated classrooms in terms of internal or external factors that affect them when they conduct learning activities. One-to-one computing in the classroom requires changes in teachers and in the school infrastructure [1]. The teachers' orchestration activities during tablet integration were grounded by the intention to facilitate, channel, and monitor shared knowledge construction while leaving the responsibility of completing tasks to the students. To relieve multiple constraints in the tablet-integrated classroom, a teacher must simplify tablet-integrated instruction by making it easier to use technology through a basic lesson plan or a simplified task [41]. Teachers must also consider instructional methods that optimize students' learning based on their individual needs by using tablets and relevant technologies for high-level pedagogic interactive activities. To enhance effectiveness in using tablets for students' learning, teachers and school administrators must consider the requirements of the school system and curriculum. School administrators need new leadership to support and manage tablet-based interactive education [2].

To implement pedagogical classrooms using tablets and relevant technologies, it is necessary to consider teachers' readiness and changes in their perceptions [29]. Ferguson and Oigara [11] suggested that teachers in a tablet-integrated classroom need targeted professional development on the pedagogical and practical uses of tablets to successfully integrate them into classroom instruction. The role of the teacher in interactive teaching using tablets should be to facilitate active involvement, hands-on experiences, a wide range of activities, the involvement of and interaction among all classroom members, and different levels of interactivity between and within subjects [37]. Successful tablet integration in classroom teaching relies on teachers' readiness for effective technology integration [42,43]. Factors that determine teachers' readiness for tablet integration include their attitudes toward and beliefs about technology in education, prior tablet experience, use of tablets for enhancement and activities, tablet proficiency, and technology-related knowledge and skills [43]. To enhance teachers' readiness, it is necessary to provide training opportunities, such as on-site teacher training; an online teacher community for sharing strategies; guidebooks and materials; and opportunities to share experience among colleagues. In addition, teachers need to observe successful examples of tablet-integrated instruction in regular classrooms. Above all, teachers need sufficient time to engage in tablet-integrated instruction and professional development. It is essential for teachers to spend time familiarizing themselves with tablet-integrated instruction and classroom management. The availability of new technology increases complexity by challenging the ways in which teachers orchestrate their students' learning until they can stabilize their teaching practices [44]. Teachers who are familiar with traditional teaching methods may face unfamiliar student or school needs brought about by new or innovative approaches. Teachers' adaptation to technology tends to proceed slowly from adoption to application in the classroom.

6. Limitations and Future Research

The results of this research have a few limitations. This study only investigated teachers' perceptions of their tablet-integration in the classroom, which may or may not be related to the teaching approach and student learning performance when integrating tablets and relevant technologies in classrooms. In addition, the success of tablet integration in the classroom might not be directly affected by teachers' perceptions, since the teachers' pedagogic knowledge and skills might have more impact than other factors on the students' experiences with tablet integration. Thus, in the future, we might examine the relations among teachers' pedagogic competence, students' experiences and engagement with their integration of tablets and relevant technologies by employing classroom observations to examine the effect of tablet integration on students in one-to-one environments. In addition, researchers could examine how teachers who are novices in the integration of tablets and relevant technologies can enhance their professional development over the long term and identify which factors they regard

as impacting the long-term enhancement of their integration of technology. Examining the differences in tablet-integrated instruction between Korean and other countries seems to offer an area of interest in the near future.

7. Conclusion

During the past decade, there have been increased efforts to integrate technologies and education and explore the student experience in the classroom. Recent research has attempted to report the teacher's role in orchestrating technology-integrated instruction and identify ways to create sustainable technology integration for the student experience in the classroom. Regarding the sustainability of the technology integration, it is necessary to understand teachers' perceptions of the pedagogical experiences and challenges of integrating tablets, particularly in the one-to-one classroom environment. Understanding the teacher's perception will enable orchestration to adopt tablet-integration during classroom activities in the one-to-one classroom with the intent to facilitate, channel, and monitor shared knowledge construction. This study contributes to the literature by examining the teacher-perceived advantages and challenges of the tablets and relevant technologies in the one-to-one classroom to ascertain the effect of technology integration on the students' engagement and experiences. In particular, the findings suggest that efforts to integrate tablets need to consider professional development regarding curriculum integration, time management for effective orchestration, and fluent use of tablets and relevant technologies. Obstacles to integration may be resolved through teacher readiness and changes in their perceptions through professional development.

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