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A STUDY ON FACTORS AFFECTING TEACHERS' SELECTION OF TEACHING TOOLS

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ABSTRACT

Teaching tools refer to the tools (kits) used at school for educational purposes. However, despite their benefits and significance for teachers and students, teaching tools are not fully used in the school environment, and issues often arise. Many studies on teaching tools have investigated the status of teaching tool development and applications, as well as the effects of the application of teaching tools on students. However, few studies cover elementary, middle, and high schools altogether, as well as the factors affecting teaching tool selection, satisfaction with the use of teaching tools, and continuous use intention for teaching tools. Hence, research is limited regarding what criteria teachers have and apply in selecting and using teaching tools and with which points they are satisfied and dissatisfied with when using and applying those teaching tools in the educational field. Therefore, this study aimed to investigate the quality of teaching tools, as perceived by teachers, and teachers' satisfaction and continuous use intention of educational content and manufacturers' services, as well as provide effective selection standards for teaching tools. This study was conducted through a survey method that effectively reflects the opinions of in-service teachers. The results showed that the factors of economy, suitability, and availability, and the sub-factors of service characteristics affect teacher satisfaction. This study offers effective guidelines to companies that produce and distribute teaching tools for the development of new products and content, while creating opportunities to prepare teaching tools and content required in the era of remote education and bring about shifts in public awareness related therewith. Further, this study's results are expected to provide fundamental data for further research to link the education (school) market, which focuses on educational content, and the teaching tool market, which has strengths in manufacturing.

KEYWORDS: Experimental (Practice) Tools, Educational Kits, Quality Characteristics, Educational Characteristics, Service Characteristics, Teachers' Satisfaction.

1. INTRODUCTION

In the era of the 4th industrial revolution, education needs to prepare people to challenge and address various social issues by viewing them from a new perspective (Dickerson et al., 2006). Hence, the need for educational innovation to cultivate talented people who could actively address diverse issues in creative ways, instead of teaching and cultivating people who simply acquire knowledge passively, has increased (Sherman & MacDonald., 2008). The Organization for Economic Cooperation and Development (OECD) also suggested that the concept of "student agency" is the core of educational innovation, forecasting a shift from "teacher-centered learning" to "student-centered learning" in the era of the 4th industrial revolution (Ryu et al., 2018). Such a movement to change the educational environment into a more realistic and student-centered one has the driving force for the efforts to use educational experimental (practical) teaching tools (kits) (hereinafter "teaching tools") in regular school education (Dickerson et al., 2006). Additionally, as both experienced and newly hired teachers with little experience felt a shortage of educational content for educational purposes (Sherman & MacDonald., 2008), they turned to teaching tools as a solution to such a situation (National Research Council., 2000).

Several studies have revealed that teaching tools are not only for students but also for teachers, providing diverse benefits. Teaching tools expand the scope students' experiences and help them understand the fundamental structures and importance of what they learn (Bruner, 1960), while assisting them in building creativity and empirically reproducing textbook content (Jang et al., 1994). Teaching tools make classes more interesting, provide unforgettable experiences to students and teachers, and help students practice what they learn at school in their daily lives. Moreover, using teaching tools could enhance students' memory, conceptual understanding, critical thinking, and other capacities (Aung & Swe., 2020). With teaching tools, learning could become more interesting, practical, realistic, and attractive; by using teaching tools, both teachers and students could participate in the class actively and effectively (Okoye et al., 2019). Teaching tools improve the quality and effectiveness of education, while contributing to the cultivation and development of students' qualifications and capacities (Khasanovna, 2021). With numerous benefits, teaching tools play a critical role in teachers' teaching activities, and teachers also emphasize that they should try to use teaching tools in applying their teaching methods (Okoye et al., 2019).

However, despite teaching tools' diverse benefits and importance, in some respects, teaching tools manufactured for educational purposes are not being properly utilized in the school environment; several issues concerning teaching tools arise. Therefore, it is necessary to objectively clarify the aspects that teachers are satisfied or dissatisfied with and where to focus when choosing teaching tools. Manufacturers and distributors of teaching tools need to accurately analyze the quality factors of the tools and develop appropriate products for the current situation and context. However, despite their efforts to develop teaching tools suitable for school curricula, it has been challenging to produce safe, economical, and suitable-for-curriculum teaching tools without collaborating with teachers who use them for educational purposes. This is understandable considering that many previous studies have examined the issues of the quality, and educational-purpose use, of teaching tools but failed to find a complete solution. This could be because research on education and the teaching tool market have been separately conducted. Most previous studies have simply focused on status analysis for the purposes of procuring teaching tools for specific subjects or improving the educational environment (Lee & Kim, 2016) or they have examined students' satisfaction with the class, but few studies have explored teachers' satisfaction with the class (Han & Seo, 2017; Lee & Kim, 2016). This implies that most studies have explored the impact of interaction between teachers and students and between students and school on satisfaction (Hwang & Kim, 2002) and have attempted to understand the selection standards and status of teaching tools, problems in using teaching tools, and benefits of teaching tools. However, there have been few studies on topics such as the selection standards of teachers in choosing and using teaching tools and with which points teachers are satisfied and dissatisfied.

Therefore, this study aimed to analyze the major factors influencing teachers' selection of teaching tools and conduct tests for teachers' satisfaction with, and their continuous use intention of, teaching tools. Most previous studies have simply classified teaching tools into categories based on which tools could be selected or assessed or examined the influence of teaching tools on students. In contrast, this study developed the selection standards for teaching tools based on the results of the previous studies and then conducted a survey on teachers with experience in using teaching tools, thereby investigating and revealing the current status of

teaching tools used by teachers in the field and the opinions and thoughts of those teachers regarding the tools. Meanwhile, considering the importance of the companies that manufacture and distribute teaching tools, this study also tested the impact of the service quality characteristics of teaching tool companies on teachers' satisfaction and continuous use intention. This study's results are expected to provide the fundamental data for further research to link the education (school) market, which focuses on educational content, and the teaching tool market, which has strengths in manufacturing.

This study aimed to examine teachers' satisfaction with, and continuous use intention of, teaching tools concerning the quality of teaching tools, educational content, and the services provided by manufacturers as perceived by teachers; to provide the grounds for deciding where to focus in selecting teaching tools and which teaching tools are effective; to provide useful guidelines for teaching tool manufacturers and distributors on the development of new products and content; and to create opportunities to prepare teaching tools and content necessary for the era of remote education. In this study, "quality characteristics" related to the quality of teaching tools, "educational characteristics" related to educational content, and "service characteristics" related to the servicing processes of teaching tool companies, were set as the independent variables; teachers' "satisfaction" was set as the mediating variable, and "continuous use intention" was set as the dependent variable, and the relationships among them were tested.

2. THEORETICAL BACKGROUND

2.1. Experimental (Practice) Teaching Tools (Kits)

Teaching tools have been referred to using many different terms, including teaching aids, instructional materials, instructional aids, and aids to teaching, and diverse definitions have been suggested. Additionally, previous studies have presented different definitions of teaching tools, and different expressions and words have been used to indicate teaching tools depending on the type of learners and the subject. Sometimes, "teaching materials" and "teaching tools" are used interchangeably, and sometimes, they are distinguished; moreover, many ambiguous and confusing concepts and definitions are used to refer to teaching tools (Park et al., 2009).

Lee and Kim suggested that "teaching tools" is an umbrella term to collectively refer to various educational media, particularly specific objects that are directly used for teaching and learning activities for the purpose of efficiently achieving educational objectives (Lee & Kim, 1991). Lee defines teaching tools as practice kits to make practice classes more convenient for teachers and students, and are sold by teaching tool companies that primarily design and process those teaching tools (Lee & Kim, 2007), whereas Kim claims that teaching tools play a crucial role in ensuring activities to conceptualize and abstract the knowledge acquired by learners (Kim, 2015). Furthermore, Jeong suggests that teaching tools refer to educational materials and tools for group and personal activities (Jeong, 2017).

According to Bruner, teaching aids help teachers expand the scope of students' experiences, assisting students in understanding the fundamental structure of the educational materials and maximizing the importance of what they learn (Bruner, 1960). Okoye, Nwobodo, and Osuji argue that instructional materials are the essential tools required for school classes and learning to improve students' academic performance and teacher efficiency (Okoye et al., 2019), whereas Parwata and Sudiatmika define teaching tools as what helps students learn effectively and efficiently (Parwata & Sudiatmika, 2020).

In summary, previous studies suggest that teaching tools refer to all types of instruments used for an easier and more effective teaching deployment, thereby allowing students to freely express their ideas and supporting teachers' activities. Considering this, in this study, teaching tools are defined as the instruments (kits) used for learning activities by students at school that also help teachers perform teaching activities easily and effectively.

2.2. Usefulness and Problems of Using Teaching Tools

Teaching tools are used in various manners in different subjects, and they have significance not only for students but for teachers. Previous studies have demonstrated that teaching tools promote effective interactions between teachers and students, as well as among students, and make active learning occur by allowing students to voluntarily participate in activities (Jeong & Kwak, 2009), while also enhancing students' motivation and interest in learning (Kim, 2015). Further, using teaching tools could improve students' ability to memorize basic knowledge, assist students in better understanding what they are learning (Aung & Swe., 2020), improve students' capacities (Parwata & Sudiatmika, 2020), enhance the quality and effects of education, and contribute to the formation and development of

qualifications and competences (Khasanovna, 2021).

Although teaching tools are essential, diverse issues have emerged owing to many difficulties found in the school environment and faced by teaching tool manufacturers. Problems with teaching tools can be categorized into those related to the usage of teaching tools and those related to teaching tool quality, as well as into the problems caused within school (from the perspectives of schools and teachers) and those caused from outside of school (from the perspectives of teaching tool manufacturers).

First, if we investigate the problems related to the usage of teaching tools in the school environment, teachers mostly tend not to use teaching tools at regular middle and high schools because of tight teaching schedules (Chan, 2000). While many teachers agree that experimental practices are effective in encouraging students' interest and participation, they also fear situations in which controlling students is difficult and when a risk of safety-related accidents exists (Yoon, 2008). Additionally, many teachers are still not aware of the benefits of using teaching tools in improving students' capacities. Some students conclude that using teaching tools does not have a significant effect on their development, considering that learning from textbooks is sufficient (Parwata & Sudiatmika, 2020).

Second, issues with teaching tools are related to the perceived quality of teaching tools from the perspectives of schools and teachers. This issue also concerns the low quality of teaching tools and the problems of teaching tool manufacturers and distributors (hereinafter referred to as teaching tool manufacturers). Numerous studies have pointed out that, in many cases, it is difficult to correctly conduct experiments as intended by using teaching tools because their quality is mostly subpar and they are not sufficiently precise (Jang et al., 1994). Furthermore, in many cases, such experiments did not lead to the consequences intended by the teacher or as per the textbook (Kim & Oh, 1998). This could be because most teaching tool distributors and manufacturers in Korea are small-sized businesses that produce many types of products in a small amount (Jang et al., 1994). Additionally, several companies import and sell low-priced Chinese products and do not guarantee safety (Park et al., 2009). Moreover, few studies specifically explored what teaching tools should be used to teach students in classes and in which manner; thus, the role of teaching tools in the school environment could be restricted to temporarily intriguing interest and curiosity rather than improving the understanding of concepts and developing meanings (Choi & Park, 2008). Some studies have also found that teaching tools do not help student learning, as commercially produced teaching tools are mostly manufactured by those who are not educational experts (Aung & Swe., 2020).

It was hard to find any previous studies conducted on the issues related to the usage and quality of teaching tools as perceived from the perspectives of teaching tool manufacturers. Thus, this study referred to the opinions collected from the Delphi expert panels, who participated in this study, particularly from the owners and presidents of teaching tool manufacturers. First, they responded that even though teaching tool manufacturers want to produce various types of products in line with the curriculum, most teachers demand low-priced items to meet the criteria under the school budget system; therefore, teaching tool companies face many difficulties. Second, teaching tool companies desire to sell quality certified products on the market, but obtaining certifications, such as the Korea Certification (KC) for low-priced teaching tools, is costly. Lastly, providing after-sales services for low-priced teaching tools is typically impossible; thus, they have no choice but to respond to customer claims by providing new products or refunding their products. Although the number of expert panels is not sufficiently large to generalize their opinions, this implies that the reasons they provided lead to lower product quality. Their opinions may not be representative of all teaching tool manufacturers; however, it is determined that teaching tool companies encounter numerous obstacles. Nonetheless, it is still true that teaching tool manufacturers and distributors do not appropriately respond to the demands of teachers and do not make sufficient efforts to develop products in collaboration with teachers of educational institutions. Nonetheless, such issues are not restricted to teaching tool companies, and addressing those issues requires close cooperation and consultation with teachers or educational institutions.

Previous studies revealed a conflict between those working in the educational field at school and teaching tool manufacturers regarding their perspectives. Considering that the issue has not been addressed yet, despite diverse types of studies, cooperation to correctly understand and overcome the issue is needed, rather than blaming any party.

2.3. Factors Affecting Teaching Tool Selection

Studies on the relationships between product quality and services and satisfaction and repurchase

intention (continuous use intention, loyalty, etc.) have been consistently conducted in various aspects. The most frequently used model in customer satisfaction studies is the method of explaining the disconfirmation between perceived and expected quality depending on the use experience (Lee, 2000). Consequently, consumers compare the performance with their expectations before consuming products and services and then develop perceptions of expectancy disconfirmation and satisfaction judgment (Oliver, 1993). As a result of satisfaction, customer loyalty, such as repurchase intention and development of a positive word-of-mouth effect, is established, affecting business performance (Lee & Lee, 2012). The current study examined the impact of the quality and services of teaching tools on teachers' satisfaction and continuous use intention. Therefore, this study set the "quality characteristics" related to teaching tool quality, the "educational characteristics" related to educational content, and the "service characteristics" related to service processes of teaching tool companies as independent variables, while setting teachers' "satisfaction" as the mediator and "continuous use intention" as the dependent variable." Subsequently, we validated the relationships of those variables.

It has generally been reported that in most transactions, products and service factors are involved. Customers make an assessment considering the balance between services and the importance of those services (Hinkin & Tracey, 2003), and customer satisfaction plays a mediating role for product quality, service quality, and repurchase intention (Cho et al., 2008). Therefore, it is important to measure the product and service quality of teaching tools, while investigating the effects of such qualities on customer satisfaction and repurchase intention.

According to previous studies on product quality, service, satisfaction, and continuous use intention, satisfaction is the outcome variable for such factors, as product and price, and it is often set as the antecedent variable for continuous use intention in analysis. Woodside, Frey, and Daly argue that customers' judgment on services affects overall satisfaction (Woodside et al., 1989), Tsiotsou claims that satisfaction is a significant predictor for customer loyalty (Tsiotsou, 2006), and Zeithaml, Berry, and Parasuraman reported that satisfied customers expressed a strong repurchase intention and recommend the relevant service to others (Zeithaml et al., 1996). Based on previous studies' results, this study also intended to insert the produce quality and service as major antecedent variables for satisfaction in the analysis, while setting continuous use intention as the outcome variable. Additionally, quality variables were categorized into "quality characteristics," which are based on the product quality of teaching tools; "educational characteristics," which refer to educational quality based on educational aspects; and "service characteristics," which are related to teaching tool manufacturers. However, teaching tools should be categorized differently from other products usually traded on the market. To apply teaching tools in the school environment, appropriate teaching tools should be selected considering their characteristics and the reality and context of the school concerned (Lee & Kim., 2016). Consequently, teaching tool selection mainly depends on what and how to teach (Ahmed & Othman, 2018). Nam explains factors affecting teaching tool selection by classifying those factors into the domains of quality and education; the quality domain consists of five categories: safety, functionality, convenience, design, and arrangement/maintenance, whereas the education domain consists of six categories: need, content, manual, utility, creativity, and appropriateness (Nam, 2014). Jun classified the factors into safety, subject compatibility, multi-purposefulness, ease of control, economy, universal design, gender equality, and durability (Jun, 2018). Furthermore, Essa classified it into suitability for development, activeness, openness, feedback, multi-purposefulness, safety and permanency, attractiveness, androgyne, diversity, and durability (Essa, 2019). Aung and Swe classified it into relevance, suitability, educational nature, simplicity, and learner-centeredness (Aung & Swe., 2020), whereas through the literature review and CIT survey, Ig-hyeng and Hong classified and analyzed factors affecting teaching tool selection into the domains of product quality, educational quality, and service quality (Cho & Hong, 2022).

For the factors affecting teaching tool selection analyzed in this study, subfactors for each variable were determined based on the cases analyzed in previous studies. First, the "quality characteristics" variable, which is based on the product quality of teaching tools, was classified into five subfactors: safety, economy, functionality, ease, and durability, whereas the factors related to educational quality focusing on educational nature were set as the "educational characteristics" variable, which was classified into four subfactors: suitability, creativity, availability, and content. The service process of teaching tool companies was set as the "service characteristics" variable and classified into three

subfactors: reliability, accessibility, and after-sales services.

2.4. Satisfaction

Research on customer satisfaction can be largely divided into three categories: the concept and measurement of customer satisfaction, the process of customer satisfaction, and the relationship between customer satisfaction and business performance. The process of customer satisfaction can be further divided into antecedent, outcome, and moderating variables of the customer satisfaction process (Lee, 2000). As this study aimed at testing teachers' satisfaction with teaching tools, we mainly focused on examining the antecedent and outcome variables for the concept and process of customer satisfaction.

Satisfaction refers to the state of mind observed when a person assesses the level of satisfaction regarding their feeling of surprise experienced while purchasing or consuming a product, or when unidentified expectations and consumption experiences of a consumer are combined with the consumer's past experiences (Oliver, 1981). Satisfaction is the main motive making people choose where to buy things and repurchase those items (Khan et al., 2015), and it is an essential element for traditional and online businesses (Ho & Wu, 1999). Based on the findings of previous studies, it also applies to the educational service sector in principle. Specifically, teachers do not use only a single teaching tool but various teaching tools along the curriculum, and periodically use new teaching tools. Considering this, satisfaction is also an essential element in this context.

Previous studies on educational satisfaction have mostly focused on surveying students' satisfaction level, who are service recipients, and research in this area has been conducted on the concept of student satisfaction (Oh et al., 2009). Among the studies on satisfaction regarding teachers, many have measured the job satisfaction of teachers (Lee & Lee., 2017). Consequently, satisfaction, as explored in this study, does not concern the relationship between ordinary consumers and businesses, but rather the level of satisfaction as perceived throughout the process of elementary, middle, and high school teachers using experimental (practice) tools (kits) required for learning and applying those tools to educational activities.

This study aimed to validate satisfaction using a multi-item scale containing questions on the overall satisfaction of teachers and the attribute satisfaction of each variable.

2.5. Continuous Use Intention

It is not simple to predict and analyze the economic value of customer satisfaction and the profitability of improving customer satisfaction. Therefore, companies often employ indirect measurement methods for customer satisfaction using variables such as customer retention rate, repurchase intention, or customers' intention to recommend the product to others (Hwang, 2005). Among them, different terms are used to refer to repurchase intention, including continuous use tension, use intention, post-purchase intention, intention of continuous use, and intention to continue using. In this study, the term "continuous use intention" means that teachers repurchase and consistently use teaching tools throughout the curriculum.

Among the previous studies on continuous use intention, Bhattacherjee claims that continuous use intention means to what extent a person who experienced a system in the past has intention to keep using the system (Bhattacherjee, 2001), whereas Kuo, Wu, and Deng maintain that post-purchase intention refers to the tendency of a customer to purchase goods or services at the same store and share his/her experience of using such goods or services with friends or relatives (Kuo et al., 2009). Jeong defines continuous use intention as the act by a customer, who used a service once or more, of using the service continuously, and it also means the expression of willingness or belief for a certain action to be taken in the future, developing positive attitudes (Jeong, 2018).

As presented above, customers' intention to repurchase products or continue using services is mainly determined by their satisfaction with prior use of the products or services (Anderson & Sullivan, 1993; Oliver, 1981;1993) [26,38,46]. This indicates that continuous use intention could be used as the outcome variable for customer satisfaction, in line with the findings of many studies reporting that satisfaction has a positive impact on loyalty and repurchase intention for online shopping (Khan et al., 2015), or that service quality and customer satisfaction play a critical role in forming purchase intention of customers (Cronin & Taylor, 1992; Devaraj et al., 2001).

In education-related research, repurchase intention typically refers to re-entry intention or word-of-mouth effects. However, this study intended to confirm whether teachers in the educational field have the intention to continuously repurchase the experimental (practice) tools and services that they purchased and used for teaching,

use the services again in the future, or recommend such products or services to others (or transfer words of mouth), and continuous use intention was defined accordingly. This study also aimed to measure whether there is continuous use intention on a Likert scale and verify whether the participants have intention to recommend the products and services they used.

3. RESEARCH MODEL AND HYPOTHESES

3.1. Research Model

This study aimed to investigate the satisfaction and continuous use intention of teachers for teaching tool quality, educational content, and services provided by manufacturers and suggest where to focus in purchasing (selecting) or assessing teaching tools and the criteria for judging the effectiveness of the tools. For this study, "quality characteristics" related to teaching tool quality, "educational characteristics" related to educational content, and "service characteristics" related to the service process of teaching tool companies were set as independent variables, "satisfaction" of teachers as the mediating variable, and "continuous use intention" as the dependent variable. Based on this, a research model presented in <Fig. 1> was established.

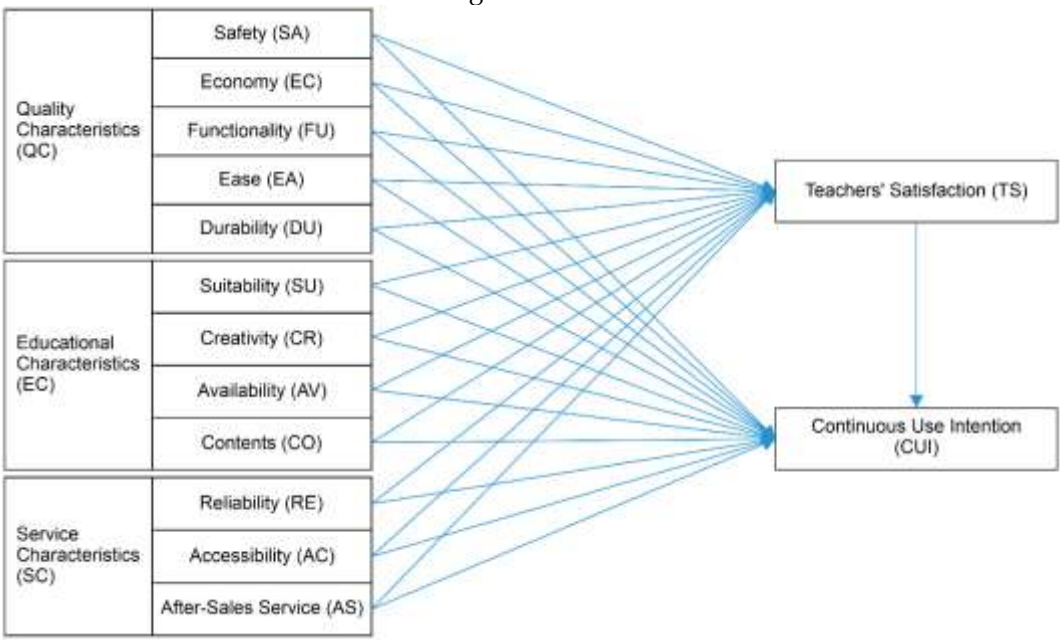

Fig. 1: Research Model.

3.2. Establishing Research Hypotheses

For empirical analysis, a research model was established based on the theoretical backgrounds as examined in the previous section, and hypotheses were set up centered on the research model for analysis and verification.

In previous studies, factors affecting teaching tool selection were classified mostly in relation to teaching tool quality. In contrast, Nam classified teaching tool selection factors into the domains of teaching tool quality (safety, functionality, convenience, design, arrangement/maintenance) and education (need, content manual, availability, creativity, appropriateness) (Nam, 2014). Ig-Hyeng and Seok classified those factors into the domains of product quality (safety, functionality, convenience, design, economy, maintenance), educational quality (need, suitability, manual, availability, creativity), and service quality (tangibility, reliability, coverage) (Ig-Hyeng & Seok, 2021). Based on those previous studies, this study classified teaching tool-related factors into the categories of quality characteristics (safety, economy, functionality, ease, durability), educational characteristics (suitability, creativity, availability, content), and service characteristics (reliability, accessibility, after-sale service). From such classification, this study established the following research hypotheses:

H1: Each factor of quality characteristics for teaching tools would have a positive impact on teachers' satisfaction.

H2: Each factor of educational characteristics for teaching tools would have a positive impact on teachers' satisfaction.

H3: Each factor of service characteristics for teaching tools would have a positive impact on teachers' satisfaction.

H4: Each factor of quality characteristics for teaching tools would have a positive impact on

continuous use intention.

H5: Each factor of educational characteristics for teaching tools would have a positive impact on continuous use intention.

H6: Each factor of service characteristics for teaching tools would have a positive impact on continuous use intention.

H7: Teachers' satisfaction would have a positive (+) impact on continuous use intention.

A limited number of studies have explored teachers' satisfaction or continuous use intention for teaching tools. Moreover, very few studies have investigated the mediating effect between teachers' satisfaction, continuous use intention, and factors affecting teaching tool selection. Ig-Hyeng and Seok classified the factors affecting teaching tool selection into the groups of product quality, educational quality, and service quality and investigated the mediating effect between those factors, teachers' satisfaction, and repurchase intention (Ig-Hyeng & Seok, 2021). Their analysis revealed that educational quality and service quality had a significant impact on repurchase intention under the mediation effect of teachers' satisfaction. The current study established the following hypotheses to investigate whether teachers' satisfaction has a mediation effect between teaching tools' quality, educational, and service characteristics, and continuous use intention.

H8: Teachers' satisfaction would have a mediation effect among teaching tools' quality, educational, and service characteristics, and continuous use intention.

H8-1: Teachers' satisfaction would play a mediating role between each factor of quality characteristics and continuous use intention.

H8-2: Teachers' satisfaction would play a mediating role between each factor of educational characteristics and continuous use intention.

H8-3: Teachers' satisfaction would play a mediating role between each factor of service characteristics and continuous use intention.

4. RESEARCH METHOD

4:1. Study Participants

This study's participants were incumbent elementary, middle, and high school teachers countrywide. All participants gave their informed consent for inclusion before they participated in the study. Particularly, considering this study's characteristics, subjects needed to be restricted to the teachers teaching subjects for which teaching tools are frequently used. Among elementary school teachers, for whom there was no restriction regarding which subject they were teaching, the researchers encouraged those who used teaching tools more frequently than their peers to participate in the survey. Middle and high school teachers, mainly science (physics, chemistry, earth science, biology) and technology/home economics teachers were encouraged to participate in the survey, but no restrictions were put on the subject that the participants were teaching so that every teacher who had an experience using teaching tools could participate in the survey. Additionally, teachers who were teaching invention/gifted classes, afterschool classes, classes for creative field activities, classes under the free semester (school year) system, and vocational training classes were also invited to participate in the study.

4.2. Research Method

The data were collected from the survey results, while conducting the literature review and empirical analysis as well. Although it could be of a higher level of validity and reliability to use the publicly available data, this study intended to perform empirical analysis based on the survey results due to the lack of relevant data.

For the literature review, factors affecting teaching tool selection by elementary, middle, and high school teachers were categorized into teaching tools' product, educational, and service quality, and the existing theories were examined. By doing so, factors belonging to teaching tools' quality, educational, and service characteristics were identified, based on the established theoretical background.

For empirical analysis, a research model and research hypotheses were established based on the factors of each variable identified through the literature review. Subsequently, through the primary and secondary Delphi surveys, the factors of each variable were validated, and survey items were developed.

Online surveys were conducted for elementary, middle, and high school teachers nationwide. The data collected through the surveys were statistically processed and used to validate research hypotheses. Statistical analysis was performed using the SPSS 22 program through frequency analysis, validity and reliability analysis, factor analysis, and correlation analysis. The AMOS program was employed to confirm model fit, and hypothesis testing was conducted through path analysis for the structural model.

4.3. Operational Definition of Concepts

In this study, products refer to all types of teaching tools used for school education, including experimental (practice) kits and apparatus and materials, whereas the quality characteristics of teaching tools mean the quality-related factors of teaching tools. Such product quality of teaching tools was set as the "quality characteristics" variable, and the survey consisted of five subfactors (safety, economy, functionality, ease, durability) and 19 items.

This study aimed to examine not only the hardware of teaching tools but also their software-related factors. Thus, such software-related factors were set as the variable of educational characteristics, thereby confirming whether teaching tools support the activities required under the curriculum; if they are compatible with the objectives and goals of education; whether they are appropriately equipped with the manual (user guidelines) and additional materials, including video materials used for educational purposes; and whether they are well structured and designed to help students develop problem-solving abilities and creativity. Subfactors of the educational characteristic variable included suitability, creativity, availability, and content.

Service characteristics are similar to the service provision quality, and their descriptions focus on the relationship between teachers and teaching tool companies. All the procedures for teachers purchasing teaching tools, including after-sales services, delivery, and methods of purchase, were examined regarding how such procedures affected teachers' satisfaction and continuous use intention. Service characteristics in this study are the overall service procedures from teachers purchasing and receiving teaching tools from teaching tool manufacturers and sellers, and subfactors were classified into reliability, accessibility, and after-sales service.

Satisfaction was tested on a multiple-item scale pertaining to the overall satisfaction of teachers and the attribute satisfaction of each variable. The researchers also intended to confirm whether after purchasing or using teaching tools for classes, teachers had intention to continuously purchase and use those teaching tools again and recommend the teaching tools to others (or transfer word of mouth); this practice was defined as continuous use intention.

4.4. Questionnaire Design

To develop a questionnaire for this study's purpose, variables and subfactors were established based on previous studies' findings. Quality, educational, and service characteristics of teaching tools were set as independent variables, consisting of 12 subfactors and 68 items. Teachers' satisfaction was set as the mediating variable, consisting of two subfactors and 11 items, whereas continuous use intention was set as the dependent variable with three items. After identifying and developing variables and survey questions, the Delphi survey was conducted twice for validation of the variables and survey questions. Through the Delphi survey, a questionnaire was developed with five variables, 12 subfactors, and 64 items, and the survey questions were structured on a five-point Likert scale.

4.5. Empirical Analysis

4.5.1. Demographic Characteristics Of Sample

The data were collected through a survey; the participants were restricted to elementary, middle, and high school teachers, countrywide, who had experience teaching classes using teaching tools. The questionnaires were distributed online (via social media and e-mail), and participants were directed to complete the survey and reply by the designated deadline. In total, 572 questionnaires were collected from the participants. Among them, those from unqualified participants, those that were incomplete, and those with a standard deviation from 0.5 to 2.5 were excluded from the analysis. Therefore, 426 completed questionnaires were processed statistically. The demographic characteristics of the survey participants are available at the link presented in the notes to this study.

4.5.2. Validity Analysis

This study employed exploratory factor analysis to test the validity of each factor as a measurement tool, categorize the measures used as measurement indicators by mutually independent influencing factors, and identify their characteristics. Through these processes, an analysis was conducted regarding how much each variable explains individual factors. Principal component analysis was performed to extract factors, and for rotation, the Varimax orthogonal rotation method was used, which is generally used in the social sciences field. For factor analysis, measurement items whose commonality with factor loading was 0.5 or more were deemed suitable for analysis. The number of factors was predetermined, as the survey was conducted after variables were largely determined based on the literature review. Additionally, the KMO (Kaiser-Meyer-Olkin) test and Bartlett's test of sphericity were conducted to verify the sampling adequacy of the collected data for factor analysis.

The results of factor analysis for each variable are available at the link presented in the notes to this study. Quality, educational, and service characteristics, which are independent variables, were analyzed with 11 subfactors: after-sales service (A/S), suitability, functionality, durability, availability, safety, content, creativity, economy, reliability, and accessibility. In the early stage of research, based on the results of previous studies, quality characteristics of teaching tools were classified into five subfactors: safety, economy, functionality, ease, and durability. However, in the process of factor analysis, ease was integrated with functionality. According to the analysis results, KMO resulted in a very high value at 0.924. The KMO value shows the level of adequacy for factor analysis. According to the results of Bartlett's test of sphericity, the significance level was 0.000, indicating the adequacy for the factor analysis model, whereas the cumulative explanatory power of all factors was 67.655%. Therefore, the validity of the measurement tools was confirmed. After factor analysis, the composition of quality characteristics was changed from five to four subfactors and from 19 to 13 measurement variables; for educational characteristics, it was changed from 22 to 13 measurement variables—the number of subfactors remained the same. Regarding service characteristics, it was changed from 11 to 3 measurement variables—the number of subfactors remained the same.

This study originally intended to measure teachers' satisfaction with two factors, but based on the judgment after analyzing the factor analysis results, that is, it was more appropriate to measure teachers' satisfaction with a single factor, factor analysis was conducted on the criteria of the eigen value of 1. The KMO value was relatively high at 0.879, and Bartlett's test of sphericity showed a significance level of 0.000, indicating the adequacy of the factor analysis model. The cumulative explanatory power of all factors was 72.274%. Therefore, the validity of the measurement tools was confirmed. After factor analysis, the composition of the mediating variable, that is, teachers' satisfaction, was changed from two subfactors and nine measurement variables into one subfactor and five measurement variables.

As a result of factor analysis for the dependent variable, KMO was measured at 0.742, and Bartlett's test of sphericity showed a significance level of 0.000, indicating the adequacy of the factor analysis model. The cumulative explanatory power of all factors was 82.665%. Therefore, the validity of the measurement tools was confirmed.

According to the factor analysis result for all independent, mediating, and dependent variables, the structure of the study was changed from 15 subfactors (latent variables) and 64 measurement variables into 13 subfactors (including teachers' satisfaction and continuous use intention) and 42 measurement variables.

4.5.3. Reliability Analysis

To investigate the consistency of survey responses, this study conducted a reliability analysis. Among many methods for empirical assessment of reliability, Cronbach's α was used for internal consistency reliability. Criteria for Cronbach's α reliability test coefficients were established based on the results of previous studies, in the case of exploratory studies or for overall survey items, Cronbach's α of 0.5 or more indicates a high level of reliability (Chae, 1999; Cho, 2010; Jeong, 2018; Roh, 2002). Reliability analysis was performed by selecting relevant items for individual variables, such as quality, educational, or service characteristics; teachers' satisfaction; and continuous use intention. Items that could deteriorate reliability by factor for each variable were ruled out; the results are available at the link presented in the notes to this study.

Measurement results showed that every item was measured at values of 0.5 or higher, indicating that the reliability of measurement tools was confirmed. Although for some factors reliability could be strengthened if some items were excluded, such items were not excluded because they were not sufficiently significant; excluding them would result in negligible difference in the reliability level.

4.5.4. Hypothesis Test and Interpretation

Based on previous studies, this study classified teaching tools by quality characteristics (safety, economy, functionality, durability), educational characteristics (suitability, creativity, availability, content), and service characteristics (reliability, accessibility, after-sales service) and tested model fit using the structural equation to determine the influencing relationship between teachers' satisfaction and continuous use intention. Then, based on the tested reliability and validity, path analysis was conducted through AMOS for the purpose of hypothesis testing. The results of hypothesis testing are presented in <Fig. 2>.

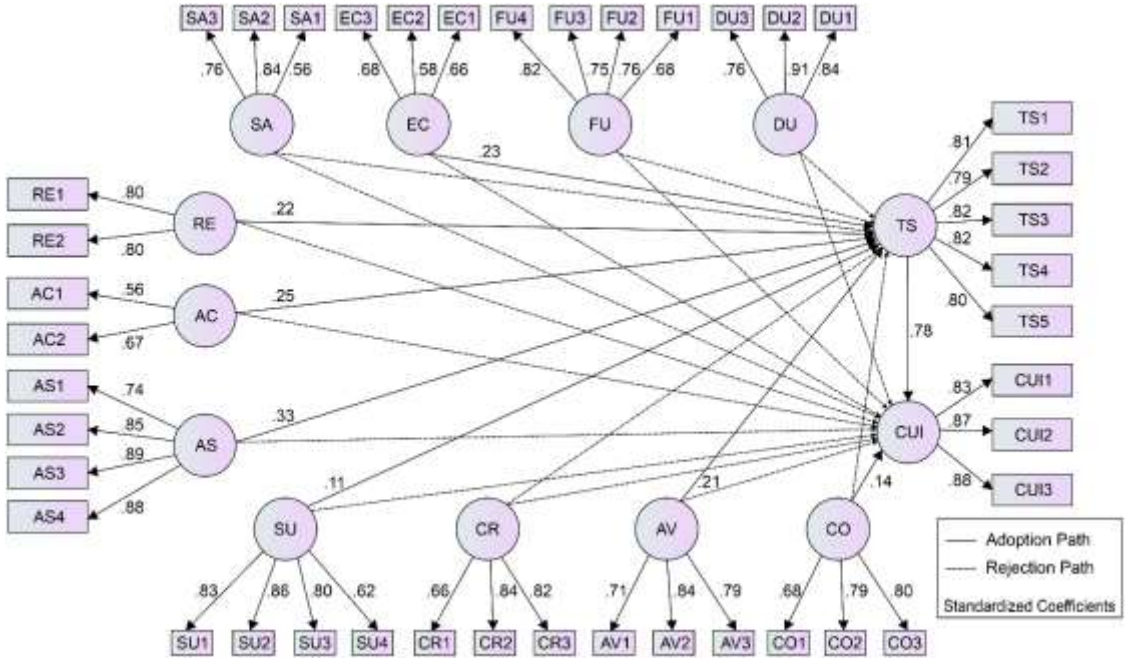

Fig: 2 Hypothesis Testing Results of the Model.

After testing the hypothesis that each subfactor of teaching tool quality characteristics would have a positive (+) impact on teachers' satisfaction, a hypothesis on the relationship between economy and teachers' satisfaction was adopted, but all the other hypotheses were rejected. The reason that safety and durability were rejected is likely because teaching tools were developed mainly focusing on the economy. Such results indicate that more efforts need to be made by teaching tool manufacturers to improve the quality of teaching tools for attributes such as safety and durability. After testing the hypothesis that each subfactor of teaching tool quality characteristics would have a positive (+) impact on continuous use intention, all hypotheses were rejected. This showed that quality characteristics of teaching tools did not have a direct impact on continuous use intention.

After testing the hypothesis that each subfactor of educational characteristics would have a positive (+) impact on teachers' satisfaction, hypotheses regarding the relationships between suitability and teachers' satisfaction and between availability and teachers' satisfaction were accepted, but all others were rejected. The reason for the rejection of the content factor is likely that additional materials (lecture materials, updated materials, and manuals) required for teaching are provided in an insufficient amount or they are not suitable for use, and a reference could be made to the studies that found that as most teachers do not thoroughly review teaching tool manuals, the level of availability of teaching tools is reduced if using them is too difficult and complicated (Park et al., 2009). The rejection of the creativity factor may indicate that teaching tools are not designed to stimulate students' curiosity or allow students to realize their ideas in different ways, but are still fixated on the traditional ways of teaching centered on transferring knowledge from textbooks. After testing the hypothesis that each subfactor of educational characteristics would have a positive (+) impact on continuous use intention, a hypothesis on the relationship between content and continuous use intention was adopted, but all other hypotheses were rejected. The content factor did not have a direct impact on teachers' satisfaction, but it affected continuous use intention. This means that if updated materials, as well as lecture materials, are included in teaching tools in a sufficient amount and detailed guidelines are provided to teachers on how to use teaching tools, teachers could use those teaching tools consistently.

After testing the hypothesis that each subfactor of service characteristics would have a positive (+) impact on teachers' satisfaction, all hypotheses were adopted. This indicates that teaching tools are delivered safely when ordered, they can be purchased easily online, and teaching tool companies respond promptly to customer complaints. After testing the hypothesis that each subfactor of service characteristics would have a positive (+) impact on continuous use intention, all hypotheses were rejected.

After testing the hypothesis that teachers' satisfaction would have a positive (+) impact on continuous use intention, the hypothesis was

adopted. Although a previous study found that if a person assesses a certain product more positively, they are more likely to recommend it to others or repurchase that product (Hwang, 2012), it was also reported that the more positive teachers' experience of using teaching tools, the higher the level of continuous use intention.

Among all factors, economy, availability, reliability, accessibility, and after-sales service had a mediating effect. First, it was observed that the indirect (mediating) effect of the economy on continuous use intention via teachers' satisfaction was significant (0.163, p = 0.037), whereas its direct effect was not significant. Considering this, it can be inferred that the economy does not have a direct effect on continuous use intention, but an indirect effect via teachers' satisfaction. Second, availability was revealed to have a significant indirect (mediating) effect (0.143, p = 0.031) on continuous use intention via teachers' satisfaction, whereas its direct effect was not significant. This confirms that availability does not have a direct effect on continuous use intention, but an indirect effect via teachers' satisfaction. Third, among the subfactors of service characteristics, reliability (0.162, p = 0.017), accessibility (0.215, p = 0.010), and after-sales service (0.161, p = 0.003) were revealed to have a significant indirect (mediating) effect on continuous use intention via teachers' satisfaction, but their indirect effect was not significant.

Based on the above results, the testing results are presented in <Table 1> for the hypotheses established to examine the mediating effect of teachers' satisfaction regarding the relationships between teaching tools' quality, educational, and service characteristics, and continuous use intention.

Table 1: Results of Mediating Effect

Hypothesis	Path	B	S.E.	p	Hypothesis
H8-1	Economy → Teachers' Satisfaction → Continuous Use Intention	0.163	0.087	0.037	Adopted
H8-2	Availability → Teachers' Satisfaction → Continuous Use Intention	0.143	0.074	0.031	Adopted
H8-3	Reliability → Teachers' Satisfaction → Continuous Use Intention	0.162	0.074	0.017	Adopted
	Availability → Teachers' Satisfaction → Continuous Use Intention	0.215	0.187	0.010	Adopted
	After-Sales Service → Teachers' Satisfaction → Continuous Use Intention	0.161	0.052	0.003	Adopted

***** *p*<.001**

5. CONCLUSION AND IMPLICATIONS

5.1. Conclusion

This study analyzed factors affecting teachers' selection of teaching tools and conducted tests for satisfaction and continuous use intention of incumbent teachers with teaching tools. By doing so, it aimed at suggesting where to focus when selecting teaching tools and the criteria based on which to assess the effectiveness of teaching tools, providing effective guidelines for teaching tool manufacturers and distributors on the development of new products and content, and creating opportunities to prepare teaching tools and content needed in the era of remote education, as well as to make shifts in awareness concerning such issues. Therefore, this study, based on the findings of previous studies, classified the characteristics of teaching tools into quality characteristics (safety, economy, functionality, durability), educational characteristics (suitability, creativity, availability, content), and service characteristics (reliability, accessibility, after-sales service) and intended to comprehensively understand the influencing relationship between teachers' satisfaction and continuous use intention through the structural equation model.

While most of the previous studies on teaching tools developed teaching tool selection standards through literature review or focused on examining the effects of teaching tools on students, this study

established new selection standards for teaching tools by reviewing the results of previous studies and then conducting surveys with teachers who actually had experiences of using teaching tools, thereby exploring and understanding the current status of teaching tools that are used in the educational field and the thoughts and opinions of teachers concerning teaching tools. Additionally, considering the significance of teaching tool companies that manufacture and distribute teaching tools, this study also validated the effects of service quality characteristics of teaching tool companies on teachers' satisfaction and continuous use intention.

For the purpose of this study, the following matters were examined.

First, this study reviewed previous studies' findings and collected and organized various study results regarding teaching tools. Above all, the researchers analyzed relevant previous studies conducted at home and abroad and established concepts concerning teaching tools. In this study, teaching tools were defined as tools (kits) used to teach students at school and help teachers perform teaching activities easily and effectively. Moreover, the benefits of using teaching tools were identified by reviewing previous international and domestic studies.

Second, considering the significance of teaching tool companies that manufacture and distribute teaching tools, this study also tested the effects of service quality characteristics of teaching tool companies on teachers' satisfaction and continuous use intention. The test results are expected to provide the basic data on which further research would be performed by connecting the education (school) market, which is centered on educational content, and the teaching tool market, which has strengths in manufacturing.

Third, after resetting the teaching tool selection standards (factors) applied by elementary, middle, and high school teachers, this study conducted an empirical analysis of teaching tool applications through a survey of teachers currently teaching at school. Additionally, the researchers analyzed teaching tools' quality as perceived by teachers, as well as teachers' satisfaction and continuous use intention of educational content and services provided by teaching tool companies, and then confirmed a mediating effect. This is what distinguishes this study from previous studies that did not perform an empirical analysis sufficiently but mostly relied on a literature review.

5.2. Implications

This study has the following implications:

First, this study established new standards regarding factors affecting teaching tool selection and validated those standards with incumbent elementary, middle, and high school students. While most of the previous studies on teaching tools set teaching tool selection standards through a literature review, but did not review those standards by doing surveys with teachers, this study is distinguished from other research papers and has academic significance in that it conducted validation through an empirical analysis of the status of teaching tool applications in reality by incumbent teachers and the important factors affecting teaching tool selection as perceived by teachers. Moreover, in this study's conclusion, a comparison was made between what teachers considered before using teaching tools and teachers' satisfaction after using teaching tools, which could serve as important guidelines on teaching tool selection standards for other teachers.

Second, this study provides practical implications for teaching tool companies, as they could use the teaching tool selection standards suggested by this study when they collect and analyze empirical data for teaching tool development and establish systematic product and content development plans. According to the study findings, teaching tool manufacturers had accepted some of the factors considered as important by teachers. However, factors such as safety, functionality, creativity, and content, despite their significance, are still lagging regarding how many products meet the criteria for such factors. For this point, teaching tool manufacturers need to actively review, and the data presented in this study could provide the basis for such efforts.

Third, this study has significance in that it conducted research on teaching tools from a comprehensive perspective reflecting opinions of teachers and teaching tool manufacturers by adding service characteristics to the factors affecting teaching tool selection. Most previous studies have been conducted on students and considered opinions and ideas of teachers; very few studies have additionally examined the details of services provided by teaching tool manufacturers. From this, it could be assumed that previous studies have not sufficiently understood teaching tool manufacturers. Moreover, teachers provide teaching so that educational objectives can be achieved according to the curriculum, and they need to prepare teaching tools and educational content as necessary. However, completing those tasks is usually not easy in the

current situation characterized by a lack of communication between teachers and teaching tool manufacturers.

5.3. Limitations and Issues for Future Research

The limitations of this study and directions for future research are as follows.

First, this study conducted a survey on elementary, middle, and high school students countrywide, but most of the survey respondents were in the Seoul metropolitan area. Consequently, limitations exist in generalizing the study results. Future research should select samples proportionate to the number of schools and students by region to improve the probability of generalization.

Second, the study survey was conducted during the COVID-19 pandemic when classes using teaching tools were not fully normalized. Therefore, survey respondents may have provided somewhat extreme answers or underestimated the severity of the issues they were experiencing. For more accurate testing, future research needs to be done in an ordinary environment.

Third, this study conducted research on the teaching tools that teachers actually used in the educational field and did not set any restrictions on the types and targeted users of teaching tools. However, a simple cross-sectional survey has limitations in measuring such experiences of using teaching tools. Future research should perform a longitudinal study on the usage of teaching tools.

Fourth, this study has significance in that it added service characteristics of teaching tool manufacturers in the factors affecting teaching tool selection by teachers. However, it was hard to fully reflect the opinions of teaching tool manufacturers. Considering this, further research is necessary on teaching tools from the perspectives of teaching tool companies. Such research is expected to provide the basic data to investigate the education market and the teaching tool market objectively.

Finally, by examining previous studies' findings, this study offered an overview of the importance of teaching tools in remote/online classes, which have begun to be extensively used during the COVID-19 pandemic, and the difficulties in using teaching tools. However, there were challenges in applying those findings in conducting research. In future research, it may be necessary to establish the criteria to identify factors affecting teaching tool selection for remote classes and discuss the measures to use those teaching tools.

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