



Tool, Toy, Telephone, Territory, or Treasure of Information: Elementary school students' attitudes toward the Internet

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ARTICLE INFO

Article history:

Received 23 June 2008

Received in revised form 19 January 2009

Accepted 2 February 2009

Keywords:

Country-specific developments

Elementary education

Gender studies

ABSTRACT

The purposes of this study are to investigate fifth-graders' attitudes toward the Internet based on the 5-T framework (Tool, Toy, Telephone, Territory, and Treasure of Information), and to understand whether gender makes any difference in their attitudes. The data were obtained from 2,253 Taiwan fifth-grade students. Through a confirmatory factor analysis, the 5-T model was validated and can be used to explain the corresponding five-factors which constitute Internet attitudes. According to the results, the students perceived the Internet mainly as a useful and powerful tool for their academic work and daily lives. Moreover, students strongly considered the Internet a toy, which is somewhat indistinguishable from the role of Tool. The students acknowledged the role of the Territory that they can demonstrate themselves by writing and sharing personal information online. Therefore, the Internet is good for both reading and writing information. The least weighted factor among 5-Ts student recognized is the role of Telephone. Gender differences exist in the subscales of Tool, Toy, Treasure of Information, and Telephone, but not in the Territory subscale of the Internet attitudes scale. This study further discusses and presents implications of the findings for teachers, parents, and future studies.

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1. Introduction

As network technology continues its explosive growth, the Internet has become and will continue to be a large part of young people's lives. Computers and the Internet have been introduced as powerful tools and as rich information resources for academic work and life in general.

In Taiwan, elementary school students start their first computer—or network—course, usually in third-grade (about 9 years old), and continue throughout their senior high school years (about 16–17 years old). By the end of 2007, the ratio of Internet penetration to elementary schools had reached almost 100%, and the ratio of Internet penetration to families had reached 72.33% (Taiwan Network Information Center, 2008). Young people now have easy access to the Internet and use a variety of Internet or network applications in their learning and daily lives.

However, researchers and classroom teachers often observe that youngsters seem to prefer the Internet's "play" factor to the Internet's "task" factor. In other words, youngsters seem to perceive the Internet as a major entertainment device akin to television. For example, whenever classroom computers are available, young students, especially boys, like to play standalone or online games. The students usually ask their computer teachers to quicken the class pace and to leave some class time during which students can freely use computers—to play games. The reason for the request is that, at home, there are usually limits to or even prohibitions on playing computer-games. Indeed, many parents are concerned that their children spend too much time playing games and that this excessive time may harm the young person's growth and development (Chou & Tsai, 2007). Parents usually wonder whether children who use the Internet should do something "more useful" with the tool. It seems that students and adults, including parents and teachers, have very different attitudes toward the Internet.

Indeed, today's current students have used computers and the Internet for many purposes. Students seem to use computers/networks not only for tool or task functions, but also for entertainment and communication functions (Livingstone, 2003; Prensky, 2004). In addition, many students like to produce Web pages or blogs to record their life episodes, express their ideas or opinions, present their interests or

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hobbies, and so forth (Huffaker, 2005; Richardson, 2006). While the Internet becomes commonplace in the world in which students live, what exactly are their attitudes toward the Internet?

In the past, many studies have investigated “computer-attitudes” (e.g., Selwyn, 1997) or “Internet attitudes” (e.g., Tsai, Lin, & Tsai, 2001). The constructs of their attitude scales include affection, usefulness, control, and related behavior. However, the above-mentioned observations lead us to rethink whether the scales omit any factor, such as playfulness. Therefore, Tsai (2004) provides a 4-*T* framework that defines Technology, Tool, Toy, and Tour/Travel as four major kinds of perceptions among Taiwanese high school students. However, in Tsai’s framework, the difference between Technology and Tool is not very clear, and the concept of Tour/Travel is somewhat confusing. In addition, this framework seems to lack an important dimension—information resources. Hence, Chou, Chen, and Wu (2007) proposed a new 4-*T* framework in which Tool, Toy, Telephone, and Treasure of Information had better and clearer definitions and distinctions. The present study further adds the fifth dimension—Territory (e.g., to present oneself in Web pages or blogs)—to the existing 4-*T* framework. Therefore, the present study re-investigates young students’ attitudes on the basis of a 5-*T* framework: Tool, Toy, Telephone, Territory, and Treasure of Information. To this end, we developed a related attitude scale based on this 5-*T* framework. In this study, the Internet as a Tool helps people perform various tasks (e.g., helping to do homework, learning/using applications); the Internet as a Toy enables users to play (online) games; the Internet as a Telephone enables users to communicate with other users; the Internet as a Territory allows users to present themselves online, and the Internet as a Treasure of Information represents the collection of online information.

2. Purpose and research questions

There are two purposes behind this study. The first is to validate our 5-*T* model. Since the 5-*T* framework proposed by this study is a hypothetical model to explain elementary students’ attitude toward the Internet, the construct should be validated. Therefore, the confirmatory factor analysis (CFA), instead of the traditional exploratory factor analysis (EFA), was applied to evidence the construct validity of the 5-*T* model. CFA is derived from the structural equation modeling (SEM) methodology. CFA and EFA, albeit both share some common features of factor analysis, function differently concerning their applications in social science. CFA is theory-driven and used to determine if the number of factors and the loadings of measured variables on them conform to what is expected based on pre-established theory. On the other hand, EFA is data-driven and used to determine the number of factors and observed variables as indicators of each latent variable (Bollen, 1989; Kline, 2005). In other words, CFA is a hypothesis testing procedure while EFA is a hypothesis generating procedure. Since our 5-*T* model was a pre-established hypothesis revised from previous theory and studies (Chou et al., 2007; Tsai, 2004), the CFA is a more appropriate technique than EFA to test the construct validity of the proposed model.

The second purpose of this study is to understand elementary students’ attitudes toward the Internet through this model, investigate any differences among their attitudes toward the Internet, and examine whether gender makes any difference in their attitudes. This study’s specific research questions are as follows:

1. Could a 5-*T* model, provided in this study, be constructed and validated through CFA? That is, does the 5-*T* model of Internet attitudes exhibit good construct validity?
2. What are elementary students’ attitudes toward the Internet from the perspective of CFA?
3. Does gender of elementary students make any difference in their attitudes toward the Internet?

3. Literature review

3.1. Studies on computer/Internet-related attitudes

The development of network technology has encouraged educational researchers to investigate the affordability and the applications of the Internet to education. Educators, administrators, and policymakers may assume that students can benefit from Internet-connected classrooms that constitute an information-rich and easy-to-access learning environment. Yet, many factors may interplay to influence students’ preference and performance in an Internet-based learning environment. Past research findings (e.g., Duggan, Hess, Morgan, Kim, & Wilson, 2001; Durndell & Haag, 2002; Peng, Tsai, & Wu, 2006; Torkzadeh & van Dyke, 2002; Tsai, 2004, 2007; Tsai et al., 2001; Wu & Tsai, 2006) have suggested that students’ Internet-related attitudes can be a critical factor affecting student learning in Internet-based instruction. Students’ positive attitudes regarding the Internet are associated with higher Internet self-efficacy (Peng et al., 2006; Torkzadeh & van Dyke, 2002; Tsai, 2004, 2007; Tsai et al., 2001; Wu & Tsai, 2006) and with more frequent use of the Internet (Duggan et al., 2001; Durndell & Haag, 2002). Those students who have higher self-efficacy in computer use or Internet use tend to consider technology-based learning tasks to be interesting and important and are more willing to persist in the learning tasks while facing challenges (Coffin & MacIntyre, 1999; Peng et al., 2006; Torkzadeh & van Dyke, 2002; Tsai et al., 2001; Wu & Tsai, 2006). Hence, teachers who understand students’ Internet-related attitudes shall possess valuable information about how to improve student learning in Internet-based instruction.

3.2. Frameworks for studying computer/Internet attitudes

To adequately examine people’s attitudes toward the Internet, researchers need an appropriate framework and a valid instrument with which they can categorize and measure participants’ attitudes. Often, researchers who strive to conceptualize research frameworks and instrument items resort to studies on people’s computer-attitudes because, as Liaw’s (2002) findings indicate, there can be a positive correlation between participants’ computer attitudes and Internet attitudes. Tsai and his colleagues (2001) modified items in Selwyn’s (1997) computer-attitude scale and added some new items to it; in this way, the researchers tried to develop an Internet-attitude scale. In addition, Tsai and his colleagues conducted a series of studies on college or high school students’ attitudes toward the Internet (Peng et al., 2006; Tsai, 2006, 2007; Tsai & Lin, 2004; Wu & Tsai, 2006), and all the studies rest on a 4-*T* framework proposed in his study on Taiwanese adolescents’ perceptions of the Internet (Tsai, 2004). In the current study, we drew on both Taylor’s (1980) 3-*T* classification of computers’

roles in education and Tsai's 4-T framework to conceptualize another 5-T framework, which we considered more appropriate for illustrating people's attitudes toward the Internet and for differentiating these attitudes from one another.

To classify roles of computers in education, Taylor (1980) raised a 3-T framework comprised of three main categories: Tutor, Tool, and Tutee. The Tutor category means that computers can function as would a teacher (i.e., computer-assisted instruction); the Tool category means that computers can function as would, for example, a pencil, typewriter, microscope, piano, or drafting table; and the Tutee category means that computers can function as would students, and that users play the role of teachers. Following Taylor's 3-T concept, we sought to identify the major roles that the Internet plays in people's lives and analyzed Tsai's (2004) 4-T framework to better understand people's attitudes toward the Internet. Tsai's framework consists of four categories: Technology, Tool, Toy, and Tour/Travel. The Technology category represents the perception that the Internet is technology that improves people's lives, while the Tool category focuses on Internet functions including information acquisition, communication, and trade. The Toy category emphasizes the pleasure and entertainment (e.g., online games) that the Internet yields. Finally, the Tour/Travel category refers to the perception that the Internet provides users with the means to navigate different locations and sites. However, among the statements that Tsai sampled to exemplify each category in the 4-T framework, we can find that the Technology, Tool, and Tour/Travel categories share some characteristics and that the categories' overlapping definitions may cause confusion. For example, Internet tools help people perform various tasks (i.e., Tool) so that people's lives can improve (i.e., Technology); moreover, the Internet is a Technology and a Tool that enables users to travel to a vast number of websites (i.e., Tour/Travel).

Reflecting on the Internet's roles in people's lives and on the obscure parts of Tsai's 4-T framework, Chou et al. (2007) proposed another 4-T framework to provide a more distinct categorization of people's perceptions of the Internet. The new framework is comprised of the following four categories: Tool, Toy, Telephone, and Treasure of Information. It was found that elementary students believed that the Internet as Toy indeed played a critical role in their daily lives, in addition to the Tool and the Information roles. However, students least recognized the role of Telephone that the Internet played in their lives.

As the Internet applications develop so quickly and the age of Web 2.0 approaches, the new 4-T framework needs further investigation. With Web 2.0, users not only download and read information from the Internet, but also write, upload, and share information to the Internet. One of the applications is the blog (short for Weblog), which is the first widely-adopted easy publishing tool of the Read/Write Web (Richardson, 2006). With blogs, Web users can create personal journals of their lives, build resource sites with friends, or filter the news of the day for others without the need to know how to code Web pages or transfer files. A survey reported by Henning (2003), indicated that among the four million published blogs, almost 53% are created by children and adolescents between the ages of 13 and 19. Therefore, it may be reasonable to add the Territory role to the other four, and then investigate students' (especially children's) attitudes toward this role.

3.3. Children's attitudes toward the Internet

Of the many segments of all Internet users, elementary school students especially draw our attention for two reasons. First, of studies on people's attitudes toward the Internet, most have focused on college students (e.g., Duggan et al., 2001; Durndell & Haag, 2002; Li & Kirkup, 2007; Liaw, 2002; Peng et al., 2006; Schumacher & Morahan-Martin, 2001; Torkzadeh & van Dyke, 2002; Wu & Tsai, 2006) and fewer studies have focused on high school students (Tsai, 2006, 2007; Tsai & Lin, 2004; Tsai et al., 2001); but we found almost no study on younger children's Internet-related attitudes. Prensky (2001) assigned the name "digital natives" to people who have been spending their entire lives with computers, videogames, cell phones, and other digital technology; and he assigned the name "digital immigrants" to people who began to embrace these digital technologies later in life. Members of the former group tend to be young, particularly in comparison to members of the latter group. And in comparison with college and high school students, most of whom are "Internet immigrants," many elementary school students are genuine "Internet natives." Therefore, elementary school students' attitudes toward the Internet may be quite different from college and high school students'.

Second, according to research findings relevant to children's time allocation on online activities (e.g., Attewell, Suazo-Garcia, & Battle, 2003; Burnett & Wilkinson, 2005; Mumtaz, 2001; Sjöberg, 1999; Valcke, Schellens, van Keer, & Gerarts, 2007), the Internet has become an indispensable part of young people's lives, and young people engage in various online activities which include gathering school-related information, gathering personal-interest information, chatting, emailing, and online gaming. While most parents and teachers expect children to spend more time using the Internet as a tool for school-related learning, children prefer online activities that entertain and please; namely, gathering personal-interest information, chatting, emailing, and online gaming (Attewell et al., 2003; Burnett & Wilkinson, 2005; Mumtaz, 2001; Sjöberg, 1999). Furthermore, although the Internet provides children with a powerful means for learning, communication, and entertainment, parents and teachers are always concerned with the Internet's possible negative effects (Attewell et al., 2003; Burnett & Wilkinson, 2005; Chou & Peng, 2007; Livingstone, 2003; Valcke et al., 2007). To prevent the emergence of the Internet's negative effects and to help children benefit from the affordability of the Internet, it is necessary to understand children's attitudes toward the Internet.

3.4. Gender differences in attitudes toward the Internet

A factor that researchers widely use to analyze study results about students' Internet-related attitudes is gender, and researchers usually expect to identify substantial differences between male students' attitudes and female students'. Many studies indicate that male students tend to exhibit more frequent use of computers and the Internet, stronger technology-related self-efficacy, and a more positive attitude toward the Internet than do female students (Bunz, Curry, & Voon, 2007; Durndell & Haag, 2002; Hargittai & Shafer, 2006; Li & Kirkup, 2007; Liaw, 2002; Peng et al., 2006; Schumacher & Morahan-Martin, 2001; Torkzadeh & van Dyke, 2002; Tsai et al., 2001; Wu & Tsai, 2006). In addition, not only male students' Internet-related attitudes but also male students' Internet use typically highlights entertainment-pleasure aspects (Chou & Tsai, 2007; Papastergiou & Solomonidou, 2005; Peng et al., 2006; Tsai, 2006, 2007; Tsai & Lin, 2004). Some gender differences in Internet-related attitudes, Internet-related activities, and Internet-related self-efficacy might result from the fact that female students usually have less access to technology than male students have and that female students, thus, have fewer relevant experiences with technology use than male students have (Papastergiou & Solomonidou, 2005; Schumacher & Morahan-Martin, 2001; Tapscott, 1998).

However, research findings have suggested that the gender divide regarding Internet access is decreasing or has disappeared and that female students and female adults are acquiring more and more experience in Internet use (Coffin & MacIntyre, 1999; Durndell & Haag, 2002; Gross, 2004; Imhof, Vollmeyer, & Beierlein, 2007; Liaw, 2002; Lin & Yu, 2008; Tsai & Lin, 2004; Wasserman & Richomond-Abbott, 2005). Recently, while some studies show no significant gender differences in Internet-related attitudes or in technological expertise (Bovée, Voogt, & Meelissen, 2007; Kuhlemeier & Hemker, 2007; Lin & Yu, 2008), gender remains a critical characteristic that some studies use to predict Internet-related attitudes, Internet-related activities, and Internet-related self-efficacy (e.g., Joiner, Brosnan, Duffield, Gavin, & Maras, 2007; Kuhlemeier & Hemker, 2007; Li & Kirkup, 2007; Lin & Yu, 2008; Morahan-Martin & Schumacher, 2007; Vekiri & Chronaki, 2008). Furthermore, studies making a comparison of Eastern and Western students' Internet use often show significant gender differences in students' Internet use and Internet-related attitudes (Jackson et al., 2008; Li & Kirkup, 2007; Ono & Zavodny, 2005; Zhang, Amos, & McDowell, 2008). Hence, examining whether gender plays a role in Taiwanese students' attitudes toward the Internet should still be meaningful.

In sum, by understanding children's attitudes toward the Internet, not only researchers but also parents and teachers can help children undertake beneficial online activities. To appropriately categorize people's attitudes about the Internet, we drew on Taylor's (1980) 3-*T* classification of computers' roles in education, re-considered Tsai's (2004) 4-*T* framework of Internet-related perceptions, revised previously-proposed 4-*T* framework (Chou et al., 2007), and propose a novel 5-*T* Model: Tool, Toy, Telephone, Territory, and Treasure of Information. On the basis of the new 5-*T* framework, we strive to better understand elementary school students' attitudes toward the Internet and whether gender differences significantly exist in their attitudes.

4. Methods

4.1. Subjects and distribution process

For this study, we used the survey method to collect data. A total of 2850 paper-and-pencil questionnaires were distributed to fifth-grade students in 79 classes at 21 elementary schools all around Taiwan. A total of 2579 data samples were returned (90.49%), and among them, 2253 valid data were collected (87.36%). The students' age range was between 10 years old and 12 years old. Among the students, 1142 (50.69%) were female and 1111 (49.31%) were male; 2152 (95.52%) had computers at home, and 1947 (86.42%) had Internet access at home. The places at which students most frequently logged onto the Internet were home (1971, 87.48%), school (231, 10.25%), and other peoples' (friends or relatives) homes (35, 1.55%). The average amount of time that the students used the Internet was 1.36 h (SD = 2.12) per weekday and 2.44 h (SD = 2.79) per weekend day.

4.2. Instruments

The questionnaire had two major sections. The first section asked students about their demographic information and their general computer use, such as where the use took place and how much time the students spent on the Internet during weekdays and weekends. The second section was the Internet attitude scale which helped us assess students' attitudes toward the five *T*-categories of the Internet. This section included 47 Likert-type statements; some of the items came from the scale created by Tsai et al. (2001), and Chou et al. (2007). During the early stage of the 5-*T* scale development, we performed CFA to analyze items based on the pilot-study sample ($n = 277$). Five items (item 16, 17, 18, 44, and 47) were removed due to low factor loading ($< .30$) (Kline, 2005). The remaining 42 items constitute the 5-*T* scale.

For the Tool measurement, statements included "I often use the Internet as a tool" and "It is easy for me to learn the new applications of the Internet." For Toy, statements included "I like to play with the Internet," "The Internet is my favorite toy," and "Using the Internet is one good part of my entertainment." For Telephone, statements included "I like to meet new friends on the Internet" and "I usually talk for a long time with my online friends." For Territory, statements included "The Internet is a good place (e.g., Blogs) to express my emotions" and "The Internet is a good place for people to keep a personal diary." For Treasure of Information, statements included "I like to use Internet information for school work" and "The online information makes society progress fast." Students were required to read the statements and to indicate the extent of their agreement on the basis of the options provided on a 4-point Likert scale: strongly agree, agree, disagree, and strongly disagree (counted as 4, 3, 2, and 1, respectively). Thus, a higher score indicates a more positive attitude toward the Internet. It is noted that the questionnaire was in Chinese, and the five *T* words (either in English or Chinese) were used only in our theoretical model and assumptions, but never shown as category names to the students in the survey.

Concerning the reliability and validity of the 5-*T* scale, the internal consistency of the scale is high (Cronbach alpha equals .952), indicating a good reliability. The construct (factor) validity was validated via CFA and illustrated in the following section.

5. Results

5.1. Evaluation and validation of the hypothetical 5-*T* model

The CFA of the 5-*T* model rested on the assumption that the Internet attitude exhibited a five-factor structure composed of Tool, Toy, Telephone, Territory, and Treasure of Information. That is, the responses to the Internet attitude scale could be explained by means of five first-order factors (the above-mentioned 5-*T*), and covariance among the first-order factors could be explained by means of second-order factors (Internet attitude). In addition, each item would have nonzero loadings on the first-order factors to be measured.

To evaluate data-model fit, this study examined "overall model fit" and "formal statistical fit indices" of the hypothetical model. The purpose of examining overall model fit is to investigate whether the model is theoretically meaningful and that no offending estimates exist. To meet the criterion of overall model fit, the signs of paths should be in correct sign and consistent with underlying theory. Besides, all estimated parameters should be statistically significant, and the errors should not be close to 1 (Kline, 2005; Yu & Yu, 2007). Judging from this, the overall fit of the hypothetical model is good since no offending estimates exist.

Regarding various formal statistical fit indices, a single index reflects only a particular aspect of model fit, and no single “magic index” provides a gold standard for all models (Kline, 2005). To evaluate the data-model fit, this study adapted the following four indices recommended by Kline (2005): chi-square, Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) to evaluate the data-model fit.

5.2. Model fit of the hypothetical 5-T model

The original model exhibited a good fit (chi-square = 10647.19, RMSEA = .066, CFI = .967, and SRMR = 0.05). However, the modification index (MI) suggested by the statistical software (LISREL 8.80) indicated some parameters should be added to the model and be estimated to improve the model fit. Therefore, some model modifications were made according to the MI. The parameters of covariance between items 2 and 3, and items 21 and 22, were added, respectively. We also set the errors between the factors “Tool” and “Toy” that correlate. The procedures and rationale of model modification will be clarified in the following paragraph. Fig. 1 presents the second-order factor of 5-T model with standardized solution.

The final 5-T model chi-square = 6255.41 ($p < .001$) indicates a bad fit. However, some problems exist when relying solely on chi-square as fit statistics since large sample size will result in a high value of chi-square and model rejection. Due to a large sample size of this study ($n = 2253$), we further discuss other indices to evaluate model fit.

The RMSEA, parsimony-adjusted index, estimates the amount of error of approximation per model degree of freedom and takes sample size into account. A value of RMSEA $< .05$ indicates a good fit; values of .05–.08 suggest a moderate fit, and RMSEA $> .10$ indicates a poor fit (Browne & Cudeck, 1993; Kline, 2005). The RMSEA of this model equals .054, indicating a moderate fit. Furthermore, the CFI = .978, thus indicating that the model fits well. The SRMR = .056, and this also indicates a good fit. To conclude, the data fit the hypothetical model well. Besides, the internal consistency of the scale is high (Cronbach alpha equals .952), also indicating good reliability.

According to the CFA results, we concluded that the 42 items listed in the scale could factorize the five first-order factors (Tool, Toy, Telephone, Treasure of Information, and Territory). Besides, the second-order factor (Internet attitudes) could be satisfactorily explained by the correlations between the five first-order factors (i.e., the 5-T model). In light of these findings, the collected data validated the construct validity of the 5-T model. That is, the 5-T model proposed in this study could satisfactorily explain students’ attitudes toward the Internet.

5.3. Elementary school students’ attitudes toward the Internet: from the perspective of CFA

In standardized solutions of SEM models, factor loadings are the equivalent of estimated correlations; and path coefficients are the equivalent of standardized regression coefficients. Fig. 1 shows that the path coefficients between the five Ts (Tool, Toy, Telephone, Treasure, and Territory) and the Internet attitudes are .96, .83, .70, .73 and .79, respectively. The magnitudes of the coefficients reflect the relative weight of these factors. The results indicated that weighted factors from the highest to the lowest were Tool, Toy, Territory, Treasure of Information, and Telephone, in sequence. Viewed from this perspective, for those fifth-graders, “Tool” is the principal attitude toward the Internet, while “Telephone” was the least weighted after other factors.

According to the modification indices, the 5-T model was modified by adding two paths—the correlations between the errors of Tool and Toy. This modification indicated that the addition of some correlations (covariance) can increase the model fit. That is, these fifth-graders’ attitudes toward Tool and Toy are highly correlated. Somehow, the students cannot distinguish between the two different roles of the Internet.

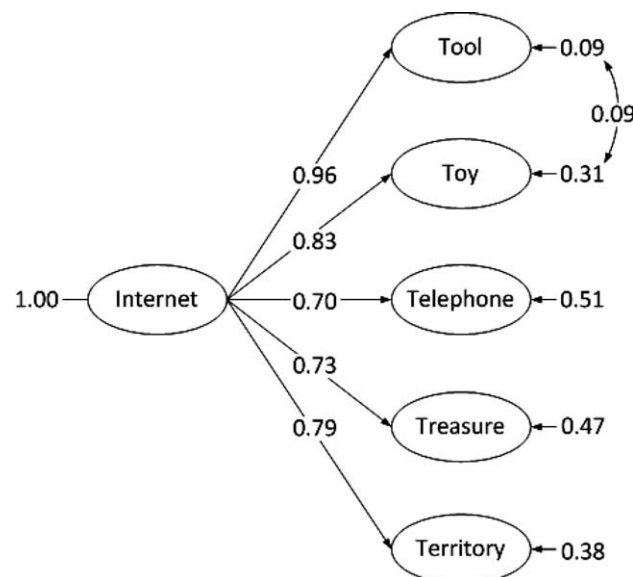


Fig. 1. The second-order factor of 5-T model with standardized solution.

5.4. Gender differences in Internet attitudes

In order to investigate whether gender makes a difference in students' attitudes toward the Internet, we categorized the 42 items into five *T* factors (subscales). The appendix lists all the items in five *T* subscales with students' means and standard deviations for each item. In order to calculate and then compare students' mean scores for each factor, we added their original scores to the items (4, 3, 2, or 1) of that factor and then divided by the number of items. If one item contributed to two factors, we categorized it into the higher-weighted factor. As shown in Table 1, the mean scores of all factors are between 2.02 and 3.35 on the basis of a 4-point Likert scale, and the MANOVA was applied to examine gender differences in each factor. The results show that the Wilks' Lambda was significant ($F = 15.710, p < .001$). The analytical results revealed that the male students' mean scores of Tool, Toy, Treasure of Information, and Telephone were higher than their female counterparts ($p = .00, .00, .00, \text{ and } .01$, respectively). However, no significant difference was found between female and male students in the Territory factor of the attitude scale.

6. Discussions

This study used a scale to probe elementary school students' attitudes toward the Internet; students were required to read the 42 statements and to indicate their responses on the basis of the four agreement levels. Through a Confirmatory Factor Analysis, we validated the five-factor structure on the assumed 5-*T* model of the Internet attitudes, that is, Tool, Toy, Telephone, Territory, and Treasure of Information. In addition, we evaluated the relative weight of these five factors by reviewing their magnitudes of the coefficients. The results indicate that weighted factors from the highest to the lowest were Tool, Toy, Territory, Treasure of Information, and Telephone, in that order. In other words, the Tool factor was the major factor while the Telephone was the lowest among the five factors.

From this sequence, it can be concluded that the Internet has indeed been considered a powerful tool for elementary students' academic work and life convenience (e.g., items 24, 41, 42). However, it is worth noting that, of the Internet-related attitudes, the Tool factor and the Toy factor are highly correlated. It means that sampled students may consider these two roles (functions) are very similar to each other without clear-cut differences. Or, they cannot clearly distinguish the two roles by related items in the scale. This result showed that these fifth-graders also rated the role of Toy as a very important role, if not the most important one, that the Internet played in their daily lives (e.g., items 25, 27, 28, 35, 37). Somewhat inconsistent with teachers' and parents' belief that, regarding education, the Internet provides powerful tools and information resources, fifth-graders seem to perceive the Internet as a major entertainment device as well. The result is consistent with past research (e.g., Attewell et al., 2003; Burnett & Wilkinson, 2005; Mumtaz, 2001; Sjöberg, 1999). Whereas parents would expect their children to use the Internet as a tool for conducting school-related learning activities, the children would also prefer online activities that entertain and please. The results of this study further explain why children like to play with the Internet because they strongly consider the Internet as a toy itself.

Territory, the new factor, had the third highest coefficient after Tool and Toy in this 5-*T* model. The analytical results not only support our argument that Territory becomes one of the key roles of the Internet, but also the addition of Territory to the previous 4-*T* model (Chou et al., 2007) makes the new 5-*T* model of elementary school students' Internet attitudes more complete. It means that fifth-graders perceive the Internet to be a virtual space in which they can record (e.g., item 10), voice (e.g., item 8), share (e.g., items 12, 15), and present (e.g., items 9, 13) themselves. One of the reasons is that with Web-publishing applications becoming more and more user-friendly, creating content of all shapes and sizes is also getting easier and easier (Richardson, 2006). In addition, some software allows students with online access to set up a personal blog at almost no cost (Prensky, 2004). Another reason may be that the blog has become more and more popular among Taiwan elementary students. In their study (Chang, Chen, & Chou, 2007), 303 (60%) of 505 surveyed fifth and sixth-graders had their own blogs, and more than 372 (73.66%) students regularly visited others' blogs. In addition, 267 (88.12%) of 303 students who owned blogs indicated a strong welcome to other people's visits and responses, which made them feel happy, facilitated exchanges of information, and strengthened and broadened their online relationships. It shows that the age of Web 2.0 has truly arrived: the Internet is no longer considered to be only for downloading and reading information, but also for creating, uploading, and sharing (personal) information. Therefore, the significance of the Territory factor and related attitudes becomes more prominent in this study.

Some researchers (e.g., Attewell et al., 2003; Burnett & Wilkinson, 2005; Mumtaz, 2001; Sjöberg, 1999) found that seeking information is one of the major Internet-related activities among elementary students. Therefore, it is expected that their attitudes toward online information, the Treasure of Information in our 5-*T* model, will contribute largely, if not completely, to students' overall Internet-related attitudes. However, the result from sampled students did not support this expectation. In other words, although students acknowledged that

Table 1
Results of the univariate ANOVA on 5-*T*s.

Subscale of 5- <i>T</i>	Univariate ANOVA on 5- <i>T</i> s				P-Value
	Subjects				
	Female (<i>n</i> = 1142)		Male (<i>n</i> = 1111)		
	M	SD	M	SD	
Tool	2.63	.62	2.80	.88	.00***
Toy	2.91	.66	3.17	.66	.00***
Territory	2.99	.68	3.04	1.26	1.36
Treasure of Information	3.26	.46	3.35	.57	.00***
Telephone	2.02	.68	2.15	.74	.01*

* $p < .05$.
*** $p < .001$.

the online information which they could browse, search for their life and school work (e.g., items 5, 6, 46), and which could have a great impact on societal progress (e.g., items 4, 7, 39), they did not weigh the Information factor as equally as the Tool, the Toy, and even the Territory factors. As Richardson (2006) stated, the “old” read-only Web in and of itself was a transformative technology. It has changed and will continue to change the way we use the Internet and our general attitudes toward the Internet, as well. Related to the above-discussed Territory factor, the results of this study seemed to confirm an emergent trend that elementary school students consider the Internet as a space for both reading and writing information.

The results indicated that the Telephone factor of the Internet attitudes is inferior to the other four factors in our 5-*T* model. It means that, for these students, the communication function of the Internet was neither obvious nor significant compared with other functions. It could be because that they had other devices, e.g., a regular phone, to communicate with other people, or because they had not yet started to develop online relationships beyond their classmates or real-world friends (e.g., items 21, 22, 32). Another possibility is that other applications, such as Blog, have already served for opinions exchanging (e.g., items 12, 15 in the Territory subscale). Therefore, the Telephone factor is not yet considered to be as significant as the other *T* factors. This result is consistent with that of Chou et al. (2007) in which the role of Telephone is not obviously compared with other *T*s. However, as email continued its high availability, and Instant Message tools (e.g., MSN) and the Internet phone (e.g., Skype) became more and more popular, elementary school students did not highly recognize the communication function of the Internet.

The results of this study showed that gender made significant differences in some factors of Internet-related attitudes. Specifically, male fifth-graders' seemed to have more positive attitudes toward the Tool, Toy, Treasure of Information, and Telephone factors than did female fifth-graders. It could be that male students tend to have more access and experience in using the Internet (e.g., Peng et al., 2006; Schumacher & Morahan-Martin, 2001; Wu & Tsai, 2006), and perhaps they use the Internet more for entertainment/pleasure aspects (e.g., Chou & Tsai, 2007). Therefore, the boys may have a more positive attitude toward the Tool, Toy, Information, and Communication domains of the Internet.

However, it is worth noting that no significant difference was found between male and female students in terms of their attitudes toward the Territory role that the Internet plays. It means that both boys and girls equally recognize the virtual space to present themselves in many forms and styles. For some, the Internet as a Territory is a powerful promoter of creative thinking and multimedia expressions (cited from Richardson, 2006); for others, this virtual space empowers them to link with the world bigger than their real life environments. Some students even develop the feeling of “grown up” by knowing their voice is on the Internet (as cited in Huffaker, 2005). Moreover, the researchers wonder whether the Internet has become a new type of diary of those digital natives. As Prensky (2004) pointed out, instead of locking away their diary in a book, at least some elementary students, both boys and girls, prefer to post content online for all to see, share, and link. Does this Internet usage change students' attitudes toward the Internet, or vice versa? Although boys and girls showed no differences in their attitudes toward the Territory factor of the Internet, do they demonstrate different identities or self-images through different content? Questions such as these are definitely interesting and need further investigation.

7. Conclusions and implications for educators and future research

In conclusion, the 5-*T* model proposed in this study was validated through statistical analysis based on the data collected from a large sample. The model has been empirically validated via CFA, and could well explain elementary school students' attitudes toward the Internet. The sampled fifth-graders, after more than two years of Internet access, developed multi-factor attitudes toward the Internet. Specifically, the most recognized factor was the Tool, followed by Toy, Territory, Treasure of Information, and Telephone. It especially draws our attention to the fact that the Territory factor, the new one in our 5-*T* model, is outweighed by the factors of Information and Telephone. Gender contributes to the differences in four of five *T* factors. However, it is more interesting to find that gender makes no difference in the factor of Territory. From the results of this study, elementary school students definitely demonstrated Internet-related attitudes quite different from, but probably more interesting than, that of college and high school students' corresponding attitudes as shown in previous studies.

The implications of these preliminary results are three-fold. First, although they did not grow up with the Internet, and although its various functions may not be part of their daily lives, adults (parents and teachers) as digital immigrants need to strengthen their understanding of the Internet-related attitudes among elementary school students insofar as these students are digital natives. By doing so, teachers and parents can undertake better communication and adequate guidance or intervention regarding children's Internet use and attitudes.

As for the second implication of the results, parents and teachers should recognize that the Toy role and the Territory role of the Internet are important and probably inevitable in children's Internet use and attitude. Parents and teachers can creatively embed these roles into their teachings and home supervisions. Examples of embedding include using instructional games as a student motivator or as a conversation topic between adults and students. Another example is using blogs to help students, both female and male, write better stories, extend their vocabulary, conduct collaborative writing works, and so on (Huffaker, 2005).

Lastly, this study's new 5-*T* model is a comprehensive one whose valid and reliable measurements can strengthen future investigation into students' attitudes toward the Internet. Indeed, this study's 5-*T* framework not only presents distinct *T*-constructs but also corrects for previous similar studies' serious omissions of the Information resources in Tsai's work (2004) and the Territory in Chou et al.'s (2007) work. The lack of distinction between the Tool factor and the Toy factor may indicate the incomprehensibility of the related items on the scale, and thus, more items on the Tool subscale may be needed for students to identify the differences between these two functions. Nevertheless, this model probably constitutes actual Internet attitudes and is able to provide a basis for the collection and the analysis of quality data, for illustrations of students' Internet use behaviors, and for measurements of other types of Internet users in future studies.

Acknowledgements

This study was supported by the National Science Council in Taiwan, Project No. NSC95-2520-S-009-006, NSC-96-2520-S-009-003.

Appendix. Students' means and standard deviations for each item in the 5-T subscales

Subscale of 5-T	Item no.	Item	Female (n = 1142)		Male (n = 1111)		Total (n = 2253)	
			Mean	SD	Mean	SD	Mean	SD
Tool (n = 5)	20	I spend a lot of time using the Internet	2.46	.97	2.79	1.01	2.62	1.01
	24	I usually use the Internet to help me do my homework	2.60	.90	2.67	3.18	2.58	.94
	33	It is easy for me to learn new Internet applications	2.64	.90	2.79	.95	2.71	.93
	41	I use the Internet regularly during the school year	2.83	.90	2.89	.94	2.86	.93
	42	I often use the Internet as a tool	2.61	.97	2.88	.96	2.74	.98
Toy (n = 14)	19	I enjoy using the Internet	3.19	.82	3.42	.76	3.30	.80
	23	I like to use the Internet whenever I have the chance	2.85	.92	3.10	3.02	2.93	.92
	25	The Internet is my playmate	2.75	.94	3.08	.92	2.91	.95
	26	I use the Internet to kill time	2.71	.97	3.00	.98	2.85	.99
	27	I like to play with the Internet	2.95	.91	3.29	.82	3.11	.86
	28	I feel happy when I play on the Internet	2.97	.84	3.24	.82	3.10	.84
	29	Using the Internet is one good part of my entertainment	3.12	.76	3.27	.80	3.19	.73
	30	Whenever I don't feel happy, I like to use the Internet	2.49	.99	2.65	1.04	2.57	1.02
	34	The Internet is very interesting	3.23	.73	3.40	.72	3.31	.73
	35	I like to use the Internet for leisure	3.10	.85	3.35	.78	3.22	.82
	36	The Internet is my good friend	2.80	.93	3.09	.92	2.94	.94
	37	The Internet is my favorite toy.	2.53	.95	2.83	.99	2.68	.98
	38	Using the Internet can help me relax	3.08	.82	3.29	.75	3.18	.80
	40	I never feel bored when I am on the Internet	2.91	.88	3.14	.88	3.02	.89
Territory (n = 8)	8	The Internet provides a good place (e.g., Blog) to express my emotions	2.94	.81	3.00	.89	2.97	.85
	9	The Internet is a good place for friends to understand each other	2.96	.86	2.98	.91	2.97	.89
	10	The Internet provides a good place to keep a personal diary	3.06	2.90	2.95	.90	2.96	.85
	11	The Internet provides a good channel (e.g., Blog, Web pages) to express my opinions	2.88	.80	2.92	.88	2.90	.84
	12	The Internet provides a good place (e.g., Blog) to exchange opinions among friends	2.89	.85	2.96	.89	2.92	.87
	13	The Internet provides a good place (e.g., Blog, Web pages) to demonstrate personal knowledge	3.10	.75	3.24	2.98	3.13	.78
	14	The Internet provides a good place to form a group	3.12	.83	3.18	3.00	3.11	.86
	15	The Internet provides a good channel to share ideas about school work	2.83	.87	2.91	3.04	2.83	.93
Treasure of information (n = 9)	1	Internet information broadens my knowledge base	3.12	.71	3.24	.72	3.18	.71
	2	Internet information enables me to do very interesting things	3.42	.62	3.49	.65	3.45	.63
	3	Internet information enables me to do very creative things	3.37	.64	3.48	2.93	3.38	.65
	4	Internet information is a great part of human knowledge	3.28	.67	3.32	.71	3.30	.69
	5	I like to use Internet information for school work	3.44	.64	3.35	.74	3.40	.69
	6	I like to use Internet information for my daily life routines	3.40	.66	3.44	.68	3.42	.67
	7	The online information makes society progress fast	3.26	.70	3.34	.74	3.30	.72
	39	Internet information makes a great contribution to human society	3.15	.77	3.36	.76	3.25	.78
Telephone (n = 6)	46	Internet information is like my encyclopedia	2.84	.93	3.04	.90	2.94	.91
	21	I spend a lot of time online to communicate with real-world friends	2.25	.91	2.29	.98	2.27	.94
	22	I spend a lot of time online to communicate with "net friends"	1.86	.87	2.10	.98	1.99	.93
	31	It is easy for me to talk online about some things I do not dare talk about in school	2.31	1.02	2.36	1.09	2.33	1.06
	32	I like to meet new friends on the Internet	1.92	.94	2.11	1.05	2.01	1.00
	43	I usually talk for a long time to my online friends (e.g., in MSN, Skype)	2.03	1.00	2.14	1.06	2.08	1.03
	45	I prefer to use the Internet than direct face-to-face to communicate with my friends and teachers in the real world	1.74	.85	1.86	.97	1.80	.91

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