

<http://ansinet.com/itj>

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

The Attitudes of University Teachers to Adopt Information Technology in Teaching

Chun-Chu Liu

P.O. Box 6-15 Tainan, Tainan County, Taiwan 717, Republic of China

Abstract: In this information era, computer and Information Technology (IT) education has become the fundamental curriculum worldwide in schools and colleges. The intent of this study was to investigate factors that affect University teachers' attitudes toward adopting IT instruction. Teachers' attitudes included their anxiety, beliefs and intentions toward IT instruction. Factors that affected these attitudes included internal and external dimensions. Besides, subjects' demographic characteristics were also be analysed. Samples were drawn randomly from three private and one public institutes in Southern Taiwan and there were 141 valid samples in this study. This study concluded that in the internal dimensions, teachers' computer knowledge, perception of usefulness and interest significantly affected their attitudes toward IT instruction. As to the external dimensions, only the climate factor influenced teachers' attitudes. Furthermore, teachers' gender, teaching departments and seniority significantly affected their attitudes. The findings would provide information for schools and human resource administrators to better understand faculty attitudes and needs in order to provide assistance and training to improve their teaching performance.

Key words: Computer attitudes, Information Technology (IT), computer anxiety, computer knowledge

INTRODUCTION

Computers and information technologies are rapidly becoming important components within societies and people's lives globally^[1]. Thus, computer and information technology education has become the fundamental curriculum worldwide in schools and colleges.

In an educational environment, teachers' positive attitudes toward any learning activity will positively influence students' learning performance. Rosen and Weil^[2] sampled university students from ten countries and found that negative teacher attitudes towards using technology would have negative impacts on student learning attitudes about using technology. Young^[3]'s study showed that positive teacher attitudes toward computers significantly related to male students' computer knowledge levels. Jones^[4] studied Australian preserves teachers of middle schools and found that teachers who seldom used computers tend not to encourage students to use computers either. Therefore, positive teacher attitudes toward computers significantly related to students' computer knowledge levels^[3,4].

Furthermore, most of the relevant researches about teachers' attitudes to use Information Technology (IT) in teaching focused on subject computer anxiety^[5]. From a broad point of view, other attitudes, such as teachers' beliefs and intentions toward computers will affect students' learning attitudes as well. There were few studies about these attitudes. Besides, many researches emphasized on teachers' demographic features such as

gender, age, learning experience that affected their teaching attitudes. Furthermore, there were few studies about external factors such as, schools policies, on-the-job training and teaching facilities. These external factors should be incorporated when discussing teachers' attitudes to use IT in teaching.

The intent of this study was to investigate factors that affected University teachers' attitudes toward adopting IT instruction in Southern Taiwan. Teachers' attitudes included their anxiety, beliefs and intentions to learn and apply IT instruction. Factors that were designed in relation to these attitudes included both external and internal dimensions and subjects' demographic characteristics. The external dimensions included teaching climate (how much IT instruction is applied among colleagues), school policy, facility and training in IT. The internal dimensions consisted of teachers' computer knowledge, perception of usefulness, interest and time to learn and apply the technology. The demographic features were gender and age of the subjects, their institutes (public or private), teaching department and seniority.

Most researches about teachers' attitudes to use IT in teachings focused on subjects' computer anxiety. Computer anxiety refers to fear of computers, feeling uneasy, stressed, nervous, terrified and hating to use computers^[6-8]. These negative cognitions about computer use will affect individual attitudes toward computer^[9,10] and learning performance such as computer courses learning^[11], database learning^[12] and subjects

perception on computer capabilities^[13]. Conversely, studies indicated that there were no association between subjects' computer anxiety and their course grades^[14,15]. Moreover, many research findings indicated that the demographic variables significantly influenced subjects' computer anxiety. For examples, female users had more negative attitudes and higher computer anxiety compared to male users^[16-19]. Older people had higher computer anxiety than younger people^[19]. Frequent users felt less computer anxiety than non-frequent users^[20]. Students majored in humanity and social science had higher computer anxiety than the ones majored in science and business^[10]. However, studies also showed that there were no relationships between computer anxiety and age^[2,21].

This study defined the internal dimensions as teachers' computer knowledge, interest, perception of usefulness and perception of time toward IT instruction. A review of literature revealed some significant influences between these factors and subjects' computer attitudes. For instance, Jones and Wall^[22] stated that when individuals spend more time in learning computers, this would increase their computer literacy and lower their computer anxiety levels. Mikkelsen *et al.*^[19] found that computer technology served an integral part in the modern business environment and with the introduction of IT, individuals' perception concerning learning opportunities is a positive response to this change in the job environments. As a result, these learning opportunities may influence individuals to perceive that the application of computer technology is useful in their jobs and lives. Muhammand and Ibrahim's^[23] study concluded that computer liking variable appeared to have the strongest influence on subjects' computer usage compared to computer anxiety and confidence variables.

This study defined the external factor dimensions as teaching climate (how much IT instruction is applied among colleagues), school policy, facility and training in IT. Most research discussed training and facility factors. For example, Temple and Gavillet^[24] showed that training would increase users' computer knowledge and lower their computer anxiety. Howard and Smith^[25] also indicated that users receiving enough training would decrease their computer anxiety levels. Mikkelsen *et al.*^[19] surveyed 336 workers in industrial networks and found that on-the-job training was the most significant factor to reduce employee computer anxiety. A study by Yaghi and Abu-Saba^[26] found that their subjects' computer anxiety was diminished by increase their experience and giving them training. Hakkinen's^[27] study also proved that after training, their subjects' computer anxiety was substantially reduced. As to the facility factor, studies

have shown that people who have computer facilities at home tend to develop more computer knowledge and confidence^[28-30]. Research also indicated that individuals who have access to computer facilities have higher computer literacy^[31].

The research findings would provide information for schools and human resource administrators in University institutes to better understand faculty attitudes and needs in order to provide assistance and training to enhance teaching performance.

MATERIALS AND METHODS

Research framework: According to the purpose of this study, the research framework is illustrated as Fig 1. Teachers' attitudes were defined as their anxiety, intentions and beliefs to adopt IT in teaching. The internal factors were described by teachers' computer knowledge, interest, perception of usefulness and time to learn and apply the technology. The external factors consisted of school policy, climate, training and facility to use IT in teaching.

Based on the research framework, the hypothesized model is as follows:

- H₁: The internal factors significantly influence teachers' attitudes toward using IT instruction.
- H₂: The external factors significantly influence teachers' attitudes toward using IT instruction.
- H₃: Teachers' demographic characteristics significantly affect their attitudes toward using IT instruction.

Research instrument: The survey was designed as a self-reported questionnaire. According the research framework, there are three subscales and one demographic section in the survey. The subscales were design by using a 5-point. Likert scale (5 = strongly agree; 4 = agree; 3 = uncertain; 2 = disagree; 1 = strongly disagree) to determine teachers' agreement with each statement. Higher scores will represent greater agreement with each statement. The negative statements were reversed when scored.

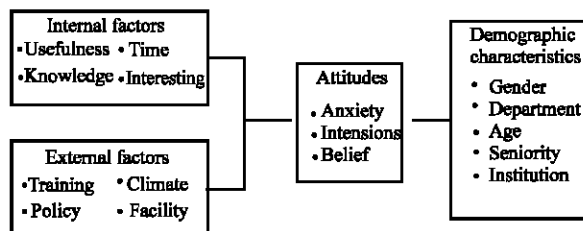


Fig. 1: Research framework

Teacher's attitudes subscale: This part of questionnaire was designed by referring to Levine and Donitsa-Schmidt's Computer Attitudes and Confidence questionnaire^[20]. The factor analysis using principal component method and varimax rotation were employed to extract factor dimensions. After eliminating the seventh statement for being ambiguously classified to any of the factors, there were three dimensions extracted with their eigenvalues. The dimensions are shown in Table 1. The factor dimensions are named as anxiety, belief and intension. The constructive validity of this subscale reached 67.22%. The reliabilities (Cronbach) of the three dimensions, were 0.761, 0.771 and 0.753, respectively.

The internal factor subscale: This part of survey was designed according to the surveys by Levine and Donitsa-Schmidt^[20] and Mikkelsen *et al.*^[19]. The same factor analysis procedure was performed and four internal factors were extracted naming knowledge, interesting, usefulness and time. The constructive validity of this subscale reached 75.30%. The reliabilities (Cronbach α) of the four dimensions were 0.837, 0.851, 0.862 and 0.607, respectively.

The external factors subscale: This part of survey was designed and referred to the questionnaires by Smith *et al.*^[32], Loyd and Gressard^[33]. As the analysed of above scales, there are three dimensions were extracted and respectively named as climate, policy and facilities. The constructive validity of this part of questionnaire reached 62.82%. The Cronbach of the three dimensions, are 0.735, 0.772 and 0.740, respectively.

In addition, the training variable which was measured in the demographic section would be included in the external dimensions. Considering the practical situation, when University teachers attend training classes in Taiwan, the measurement of the training variable was designed as four levels by training hours (4 = over 16; 3 = 9-18; 2 = 1-8 and 1 = 0).

The demographic section: Except the training feature, there were five demographic characteristics in this part of the survey. They were gender, institute, department, age and seniority. There were five categories for the department feature which were management, engineering, nursing, humanity and computer science. The institute feature was designed in two categories: public and private institute.

Population and sample: The research population consists of all full time teachers of university Institutes in Southern Taiwan. Based on 1:4 of ration for the public and private

Table 1: The results (standardized coefficients β) of the regression analysis for external and internal factors to teacher's attitudes

Factors	Attitudes		
	Anxiety	Belief	Intention
Climate	0.067	-0.182*	0.087
Policy	0.021	-0.076	0.024
Facility	-0.115	0.006	-0.103
Training	0.006	0.041	-0.175
Knowledge	-0.471	0.022	0.294**
Usefulness	-0.056	0.411**	0.400**
Interest	-0.178*	0.369**	0.193*
Time	0.372**	-0.065	0.043

*p<0.05, **p<0.01

schools in this region, samples were drawn randomly from three private institutes and one public institute. A personal distributed survey method was applied in this study. All those sampled were asked to participate in the study voluntarily and anonymously. This study drew totaling 200 participants and 150 samples were responded. The valid samples are 141.

Data analysis techniques: First, this study would yield the factor scores for all the external, internal and attitude dimensions. Next, the following statistical techniques were applied.

- To analyse how the external and internal factor dimensions affect the attitude factors, the multiple linear regression analysis was employed.
- To investigate if there is significant difference between the demographic variables and teacher's attitudes, the Levene's test was first used to test the assumption of homogeneity of variance. Then, the one way ANOVA and Scheffe's post hoc test were applied to analyse the differences between groups.

RESULTS AND DISCUSSION

Test results of multiple regression analysis: This study applied regression analysis to test if the external and internal factor dimensions significantly affect teachers' attitudes. The results (standardized coefficients β) are shown in Table 1.

Anxiety: As to the anxiety dimension, the knowledge factor significantly and negatively influenced teacher's anxiety factor ($\beta = -0.471$ and $p < 0.05$). This result implies that teachers who have enough computer knowledge tend to be less anxious about using IT instruction and vice versa. The time factor significantly and positively influences teacher's anxiety factor ($\beta = 0.372$ and $p < 0.05$). This result indicates that teachers who are busy and claim

to have no time to learn to use computers will have higher anxiety levels. The interest factor significantly and negatively influences teacher's anxiety factor ($\beta = -0.178$ and $p < 0.05$). This result shows that teachers with less interest in computers will have more anxiety levels and vice versa.

Belief: Regarding the belief dimension, the climate factor significantly and negatively influences teacher's belief factor ($\beta = -0.182$ and $p < 0.05$). This result implies that teachers who are exposed to an IT application environment develop less intention of using the technology and vice versa. It is possible that those teachers do not believe in using IT instruction. If so, they will even avoid using even though their colleagues are using it. The usefulness factor significantly and positively affects teacher's belief factor ($\beta = 0.411$ and $p < 0.01$). This result indicates that teachers who think learning and using IT instruction is useful for their jobs and lives tend to have positive beliefs about the technology. The interest factor also significantly and positively influences teachers' belief factor ($\beta = 0.369$ and $p < 0.01$). This result shows that teachers who are interested in learning and using computers will have stronger beliefs in using IT instruction and vice versa.

Intention: In writing about the intention dimension, the knowledge factor significantly and positively influences teacher's intention ($\beta = 0.294$ and $p < 0.01$). This finding implies that the more computer knowledge that teachers have, the stronger intention there is for them to apply IT instruction and vice versa. The usefulness factor significantly and positively affects teacher's intentions ($\beta = 0.400$ and $p < 0.05$). This finding indicates that teacher's positive perception about learning and using IT will promote their intention to apply IT instruction. The interest factor also significantly and positively influences teachers' intention ($\beta = 0.193$ and $p < 0.05$). This finding shows that teachers who feel more interested in the technology will develop greater intention toward using IT instruction.

The results of t- test and ANOVA: According to Table 2, male teachers significantly felt less anxious toward using IT instruction than female teachers did and senior teachers tend to have less intention on IT instruction. Besides, teachers in computer departments had the least anxiety levels and teachers in nursing department have the highest anxiety levels. Thus, teachers of nursing departments had the least intention toward IT instruction while teachers of management department have the highest intention levels.

Table 2: Test results for demographic characteristics with attitude dimensions

Demographic characteristics	Tests	Factor dimensions		
		Anxiety	Belief	Intention
Gender	Levene's test sig.	0.564	0.936	0.564
	T-test sig.	0.009*	0.381	0.949
	Male	-0.173#	-0.058	-0.004
Institute	Female	0.279#	0.094	-0.007
	Levene's test sig.	0.471	0.577	0.831
	T-test sig.	0.070	0.064	0.309
Age	Public	-0.337	-0.344	-0.190
	Private	0.069	0.0071	0.039
	Levene's test sig.	0.284	0.013*	0.385
	ANOVA sig.	0.061	0.926	0.121
	Under 30	-0.114	-0.144	0.397
	31-35	-0.104	0.031	0.058
	36-40	0.234	0.107	0.270
Department	41-45	-0.270	-0.023	-0.295
	46-50	-0.226	-0.093	-0.128
	Over 51	0.682	-0.251	-0.439
	Levene's test sig.	0.165	0.039*	0.628
	ANOVA sig.	0.030*	0.535	0.002**
	Management	-0.084	-0.084	0.792#
	Engineering	-0.088	-0.088	-0.015
Seniority	Nursing	0.417#	0.418	-0.262#
	Humanity	0.348#	0.348	-0.096
	Computer	-0.573#	-0.573	0.493
	Test sig.	0.708	0.150	0.017*
	Pearson corr.	0.032	-0.122	-0.200

* $p < 0.05$, ** $p < 0.01$ and # denotes mean factor score of the significant group using post hoc test.

CONCLUSIONS

The regression analysis concluded that none of the external dimensions affect teachers' anxiety and intention toward IT instruction. Teachers who have enough computer knowledge tend to be less anxious about IT instruction. Also, teachers who are interested in computers will have lower levels of computer anxiety. However, teachers who are busy and claim to have no time to learn to use computers will have higher anxiety levels. Teachers with more interest and usefulness perception about computers tend to have stronger beliefs in IT instruction. Besides, the more computer knowledge that teachers have, the stronger intention there is for them to apply IT instruction. The same is true for the interest factor toward IT intention.

Contrary to the prevailing assumption, teachers who are exposed to an IT application environment develop less intention of using the technology. It is possible that those teachers do not believe in using IT instruction. If so, they will even avoid using it even though their colleagues are using it.

For the analysis of demographic variables to teacher's attitudes to use IT instructions, this study concludes that there is no difference between teachers' ages with the three dimensions of attitudes, anxiety, belief

and intension. This finding is quite different from many computer attitude studies which reported that age is one of the significant factors that contribute to computer anxiety. Conversely, Maurer's^[21] research highlighted the same finding as this study. In the analysis of gender differences, female teachers are proved to be less knowledgeable, less interested and more anxious toward using IT instruction. Female teachers also think there is less IT application among their colleagues compared to male teachers. It is important for schools to encourage female teachers to be involved in learning and using the technology. For the institute factor, public institute teachers think their institutes have less support and they perceive less usefulness in IT instruction compared to private institute teachers. However, they are more satisfied with their IT facilities.

For the department variable, teachers in computer departments have the highest scores in teaching climate, receiving IT training and knowledge. Moreover, they have the lowest level in computer anxiety. These findings are quite realistic. On the other hand, teachers in nursing departments most need to improve their computer knowledge and teaching climate by receiving more training in order to reduce their anxiety level. Moreover, nursing department teachers have the lowest intention toward IT instruction. Furthermore, engineering department teachers have the lowest perception about the usefulness of technology. In the analysis of seniority, the more senior teachers are the less computer knowledge they have and the less interest they have in learning IT instruction. Therefore, they have fewer intentions of adopting IT instruction and vice versa.

In recommendations, this research suggests that the so-called information center in most every University institute in Taiwan should incorporate the functions of promoting IT instruction such as offering workshops on campus for all faculty members. Institutions can also establish a media or instructional center to provide all instructional assistance on information technology.

This study also suggests future research to further investigate the attitudes of adopting IT instruction for university teachers in the whole nation. Since age does not affect any of the external, internal and attitude factors, it is worth studying whether the same finding will be reached for the entire university teacher population in Taiwan. The research finding that engineering department teachers have the lowest perception about the usefulness of technology needs to be further investigated. The negative relationship between climate and teachers' beliefs regarding the use of IT instruction is also worthy of study.

REFERENCES

1. Coffin, R.J. and P.D. MacIntyre, 1999. Motivational influences on computer-related affective states. *Computers in Human Behaviour*, 15: 549-569.
2. Rosen, L.D. and M.M. Weil, 1995. Computer anxiety: A cross-cultural comparison of university students in ten countries. *Computers in Human Behaviour*, 11: 5-64.
3. Young, B.J., 2000. Gender differences in student attitudes toward computers. *J. Res. Computing in Edu.*, 33: 203-216.
4. Jones, A., 2000. Use of computers by teacher education students during teaching practice. (ERIC Document Reproduction Service No. ED 441 778).
5. Dupagne, M. and K.A. Krendl, 1992. Teacher's attitudes toward computers: A review of literature. *J. Res. Computing in Edu.*, 24: 420-29.
6. Cambre, M.A. and D.L. Cook, 1985. Computer anxiety: Definition, measurement and correlates. *J. Edu. Computing Res.*, 1: 37-54.
7. Igarria, M., 1993. User acceptance of microcomputer technology: An empirical test. *OMEGA Intl. J. Manage. Sci.*, 21: 73-90.
8. Loyd, B.H. and D.E. Loyd, 1985. The reliability and validity of instruments for the assessment of computer attitudes. *Edu. Psychol. Measure.*, 45: 903-908.
9. Leso, T. and K. Peck, 1992. Computer anxiety and different types of computer courses. *J. Edu. Computing Res.*, 8: 469-478.
10. Marcoulides, G.A., 1989. Measuring computer anxiety: The computer anxiety scale. *Edu. Psychol. Measure.*, 49: 733-738.
11. Mawhiney, C.H. and S.P. Saraswat, 1991. Personality type, computer anxiety and student performance. *J. Computer Infor. Syst.*, 8: 110-123.
12. Brosnan, M.J., 1998. The impact of computer anxiety and self-efficacy upon performance. *J. Computer Assisted Learning*, 14: 223-234.
13. Chou, H.W., 2001. Effects of training method and computer anxiety on learning performance and self-efficacy. *Computers in Human Behaviour*, 17: 51-69.
14. Kernan, M.C. and G.S. Howard, 1990. Computer anxiety and computer attitudes: An investigation of construct and predictive validity issues. *Edu. Psychol. Measure.*, 50: 681-690.
15. Szajna, B. and J.M. Mackay, 1995. Predictors of learning performance in a computer-user training environment: A path-analytic study. *Intl. J. Human-Computer Interaction*, 7: 167-185.

16. Colley, M., T. Gale and A. Harris, 1994. Effects of gender role identity and experience on computer attitude components. *J. Edu. Computing Res.*, 10: 129-137.
17. Busch, T., 1995. Gender differences in self-efficacy and attitudes toward computers. *J. Edu. Computing Res.*, 12: 147-158.
18. Bradley, B. and G. Russell, 1997. Computer experience, school support and computer anxieties. *Edu. Psychol.*, 17: 267-295.
19. Mikkelsen, A., T. Øgaard, P.H. Lindøe and O.E. Olsen, 2002. Job characteristics and computer anxiety in the production industry. *Computers in Human Behaviour*, 18: 223-239.
20. Levine, T. and S. Donitsa-Schmidt, 1998. Computer use, confidence, attitudes and knowledge: A causal analysis. *Computers in Human Behaviour*, 14: 125-146.
21. Maurer, M. M., 1994. Computer anxiety correlates and what they tell us: A literature review. *Computers in Human Behaviour*, 10: 369-376.
22. Jones, P.E. and R.E. Wall, 1985. Computer experience and computer anxiety. (ERIC Document Reproduction Service No. ED 275 315).
23. Muhammad A. and M. Ibrahim, 1998. The relationship of attitudes to computer utilization: New evidence from a developing nation. *Computers in Human Behaviour*, 14: 23-42.
24. Temple, L.L. and M. Gavillet, 1987. The develop. computer confidence in seniors. (ERIC Document Reproduction Service No. ED 289 073).
25. Howard G.S. and R.D. Smith, 1986. Computer anxiety in management: Myth or reality? *Communi. ACM.*, 29: 601-615.
26. Yaghi, M.H. and M.B. Abu-Saba, 1998. Teacher's computer anxiety: An international perspective. *Computers in Human Behaviour*, 14: 321-336.
27. Hakkinen, P., 1994. Changes in computer anxiety in a required computer course. *J. Res. Computing in Edu.*, 27: 141-153.
28. Geissler, J.E. and P. Horridge, 1993. University student's computer knowledge and commitment to learning. *J. Res. Computing in Edu.*, 25: 347-365.
29. Nichols, L.M., 1992. The influence of student computer-ownership and in-home use of achievement in an elementary school computer programming curriculum. *J. Res. Computing in Edu.*, 8: 407-421.
30. Rocheleau, B., 1995. Computer use by school-age children: Trends, patterns and predictions. *J. Res. Computing in Edu.*, 12: 1-17.
31. Becker, H.J., 1999. Internet use by teacher: Conditions of professional use and teacher-directed student use. *Cent. Res. Infor. Technol. Organiz.* Retrieved September 20, 2002, from: <http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.htm>.
32. Smith, B., P. Caputi and Rawstorne, 2000. Differentiating computer experience and attitudes toward computers: An empirical investigation. *Computers in Human Behaviour*, 16: 59-81.
33. Loyd, B.H. and C.P. Gressard, 1986. Gender and amount of computer experience of teachers in staff development programs: The effects on computer attitudes and perceptions of usefulness of computers. *Asso. Edu. Data Syst. J.*, 18: 302-311.