Does Professional Support Match and Influence Student Teacher's Interest to Attain Educational Technology Standards?

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Abstract

By using a sample of 59 mathematics student teachers from three Finnish universities, this study examined teacher's interest to achieve educational technology standards (Interest) in terms of professional support to achieve these standards offered to him/her by his/her faculty (Support), his/her computer attitude (Attitude) and total computer experience (Experience). It was found that (a) Support was considerably below Interest; (b) Support was not related to any of the remaining three variables; (c) Interest was directly influenced mainly by Attitude that was only shaped by Experience. Implications for teacher education are examined.

Keywords: computer experience, computer attitude, educational technology standards, teacher education

Introduction

The very first article of eJTM ([5]) pointed out the challenges to adapt mathematics education to the needs of modern ICT. Having at the same time in mind that today any education should primarily be based upon student-centred, technology-oriented learning, current educational reforms require developing and maintaining successful technology-supported teacher education programmes (see [6] and [15], for example). These programmes should make use of suitable *Educational Technology Standards* (ETS) like, for example, those proposed by International Society for Technology in Education (www.iste.org).

ETS offer a useful framework to examine the integration of technology in day-to-day teaching and learning (see [1]). However, to understand the (expected) scope of this integration and improve the state (if need be), research needs to focus on critical variables influencing the integration. Previous studies, initiated by Kadijevich (see [7-9]), found that student teacher's interest to achieve standards is primarily influenced by his/her computer attitude not by the institutional support concerning this achievement offered during his/her university study. This research thus examined whether, in the education of mathematics teachers in Finland, professional support matches and influences student teacher's interest to attain educational technology standards.

Method

Subjects

This study used in 2006 a sample of 59 mathematics student teachers who came from three universities in Finland (about 45% of the targeted population at each of these universities). Almost all subjects (85% or more for each of the universities) indicated in the survey (see extra question at the end of the questionnaire) that they did not receive any instruction on ET standards during their studies.

Design

This study used the following four variables: student teacher's interest to achieve ET standards (INTEREST), his/her total computer experience (EXPERIENCE), his/her computer attitude (ATTITUDE), and the support to achieve ET standards offered to him/her by his/her faculty (SUPPORT).

Path model

When research examines direct and indirect effects among several dependent and independent variables simultaneously, it makes use of path analysis (see, for example, [13]). This study used a four-variable path model. This model, previously utilized in [9], is illustrated in Figure 1.[1]

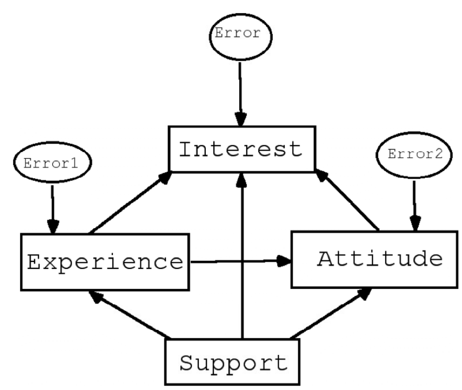

Figure 1. Path model.

Instruments

The four variables were measured by using a web-based questionnaire [2]. Details on the applied measurement can be found in [9]. The reliabilities (Cronbach's α) of theutilized measures were very good (0.84 for EXPERIENCE, 0.89 for ATTITUDE, 0.90 for INTEREST, and 0.95 for SUPPORT).

Procedure

An invitation to participate to this research was sent in April 2006 by e-mail to all students who formally registered for the final study year in the academic year 2005/2006. Based on email addresses provided by the university administration, an anonymous mailing list was used to invite the subjects to answer the web-based questionnaire mentioned above.

Statistical Analysis

The SPSS software (see www.spss.com) determined the means and standard deviations of and

[1] The study could use a regression model where the three predictors (ATTITUDE, EXPERIENCE and SUPPORT) correlate, but that model could not help us study the indirect impacts of SUPPORT and EXPERIENCE on INTEREST.

[2] The Finnish instrument can be found at www.joensuu.fi/lenni/survey/ICTSurveyFINjm.html, and the English version at http://www.joensuu.fi/lenni/survey/ICTSurveyNew.html.

correlations among the four variables. The Amos program (see http://amosdevelopment.com) examined the applied path model.[3]

Results

Table 1 presents the means and standard deviations of the four measured variables.[4] The *t*-test for paired samples revealed that, on the average, Support was below Interest ($t_{58} = -13.445$, $p < 0.01$). Table 2 gives the correlations among the four measured variables.[5] Three of the six given coefficients were significant.

Table 1. Means and standard deviations of the measured variables

Variable	M	SD
1. Interest	1.98	0.49
2. Attitude	4.02	0.48
3. Experience	0.01	0.71
4. Support	0.78	0.53

Table 2. Correlations among the measured variables
[a] p < 0.01

1.Variable	2	3	4
1. Interest	0.504[a]	0.455[a]	0.088
2. Attitude		0.517[a]	-0.100
3. Experience			0.102
4. Support			

Because the correlation between Interest and Support was marginal, the non-standardized regression weight regarding path Support -> Interest was set to zero. Figure 2 presents the obtained values for the tested path model. The direct effects of Experience on Attitude and of Attitude on Interest were positive and significant. Note that the fit indices of the tested model were very good, specifically: $\chi^2 = 0.840$ ($df = 1$, $p = 0.359$), NIF=0.980, TLI = 1.026, RMSEA = 0.000 (p[H_0: RMSEA ≤ 0.05] = 0.393), and RMSR (Root Mean Square Residual) = 0.008.[6]

[3] The sample size (N=59) was appropriate (Stevens's [14] recommendation is to have at least 15 cases per measured variable, whereas the recommendation of Bentler and Chou [2] requires at least 5 cases per parameter estimate).

[4] As each indicator of Interest and Support was scored by 0 for "none", 1 for "small", 2 for "medium" and 3 for "lar

ge", the averages of 1.98 and 0.78 mean that Interest was medium, whereas Support was less than small. As each indicator of Attitude was scored by 1 for "strongly disagree", 2 for "disagree", 3 for "neutral", 4 for "agree" and 5 for "strongly agree", the average of 4.02 means that, on the average, the subjects agreed with the given attitudinal statements.

[5] The duration of the study, 4, 5 or more years, did not correlate with Support. The study success, expressed by the number of completed courses, only correlated with Experience in such a way that more successful students had more Experience.

[6] All variables were normally distributed and no outliers were found.

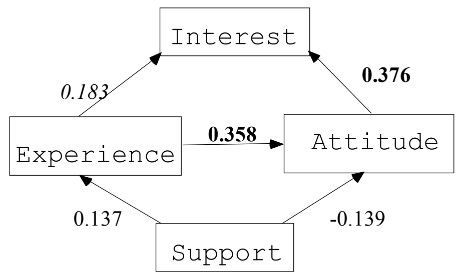

Figure 2. Path model with non-standardized regression weights
(Weights in bold significant at a 0.01 level; weight in italic significant at a 0.05 level).

Table 4. Decomposition of effects from path analysis by country
(total effects are underlined, whereas indirect effects are shaded)

Unstandardized effects	Support	Experience	Attitude	R^2
Experience	0.137	0.00	0.00	0.010 [a]
Attitude	-0.090 = -0.139 + 0.049	0.358[a]	0.00	0.291 [b]
Interest	-0.009 = 0.000 - 0.009	0.318[a] = 0.183[c] + 0.135[a]	0.376[a]	0.305 [a]

[a] $p < 0.01$ [b] $p < 0.05$ [c] $p < 0.1$ (0.05, one-tailed)

The decomposition of the effects from the examined path model is given in Table 4. Along with just mentioned outcomes concerning the six direct effects, this table shows that the impact of EXPERIENCE on INTEREST was mediated through ATTITUDE because the indirect effect of EXPERIENCE on INTEREST was significant. Note that the Amos software determined the reported significances by making use of 1,000 bootstrap samples with a bias-corrected percentile method.

Discussion

In 1995, the Finnish government produced a position paper outlining its *Information Society Strategy* for providing every citizen with opportunities to acquire the skills they will need to access the information mediated by new technology. Concerning the use of ICT in education, this vision has strongly characterized the national policy, appeared in a series of strategy papers published by the Ministry of Education (see [6]). Recalling the versatile educational use of ICT, represented in [5] (see p. 1), it is proper to assume that in the Finnish Information Society "technology has reached some kind of meta-level position, causing also a holistic change in citizens' way we think, plan, work and evaluate" (cf. p. 11). Those background variables probably calibrate student's expectations to be high, loading also increasing challenges for the teacher education programmes.

Three findings emerged from this study. Firstly, SUPPORT was considerably below INTEREST. Secondly, SUPPORT was not related to any of the remaining three variables. Thirdly, INTEREST was directly influenced primarily by ATTITUDE that was only shaped by EXPERIENCE.

The reason why SUPPORT was, on the average, considerably below INTEREST (0.78 vs. 1.98)[7] may primarily be found in the fact that the three Finnish institutions for mathematics teacher education

[7] SUPPORT was considerably below INTEREST for each of the seventeen indicators.

involved in this research did not provide opportunities for their student teachers to meet ET standards (recall that when asking if ET standards where represented to the subjects, the great majority of them answered that they did not receive any instruction on those standards). The same outcome within the same context (missing instruction on ET standards) was obtained for Finnish elementary student teachers participating in [9] (the averages were: 0.94 for Support and 1.84 for Interest). The evidence shows that Support can match Interest when student teachers receive some basic instruction on ET standards (see [7, 8]), which offer a useful framework for planning, utilizing, and managing technology-supported learning.

It was very surprising that Support neither correlated with Experience, nor did it so with Attitude or Interest. (Marginal relations were obtained for all models applicable under the Regression/Curve Estimation option in the SPSS software.) In other words, Support was not related to any of the remaining three variables. It can thus be said that Support neither respected Experience, nor did it so with Attitude or Interest. The same outcome regarding the correlations of Support and Experience and Support and Attitude was obtained for the Finnish elementary student teachers participating in [9]. It thus seems that several Finnish educational institutions do not offer Support that respects Experience (according to students' evaluations). When Support respects Experience (more precisely the nature and duration of total computer experience), a desired role of Support (a positive impact on Experience as well as Attitude) can be attained (see [9]).

Despite an inadequate educational context (an implicit and low Support that did not respect Experience), it was obtained that Interest was directly influenced primarily by Attitude, which was only shaped by Experience. This finding, which emerged in [9] for both an inadequate and an adequate educational context, requires professional teacher development to utilize Support (explicitly concerned with ET Standards at a level close to Interest) that respects Experience and develops it further, which would result in a desired role of Support in the examined four-variable context.

It is clear that, at present, Support at some Finnish institutions educating mathematics teachers is implicit and does not match and influence Interest. To improve the matters, professional development should help student teachers understand why, when and how to use technology (e.g. [3, 10, 11]), examining computer skills together with knowledge structure and pedagogical thinking (see [4]). Furthermore, student teachers should deal with ET standards in a way that makes them alive and more personally meaningful. This can be attained by encouraging student teachers to select basic indicators of the examined standards, and by supporting them to make these indicators alive through integrating several kinds of technology based learning such as applications and modelling, multimedia design, and on-line collaboration (see [7]). Of course, the discovered inappropriate state may apply to some institutions educating student teachers of other area(s), which would, if need be, improve the matters through putting these recommendations into practice.

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