MOBILE LEARNING IN SECONDARY EDUCATION: PERCEPTIONS AND ACCEPTANCE OF TABLETS OF TEACHERS AND PUPILS

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ABSTRACT

This paper reports on the introduction of the tablet computer as a personal, mobile learning tool in a secondary school in Flanders, Belgium. In this longitudinal research project, drawing upon the Theory of Planned Behavior, we question the relative extent to which attitude, subjective norm, and self-efficacy explain the prospective uptake of the device for educational purposes. The results indicate that attitudes towards the rollout are generally positive. Teachers are dominantly intrinsically motivated, welcoming it as a useful and easy to use aid. The role of attitude among pupils is strong, however they do report feelings of social influence, albeit mostly by parents and peers. The pupils also consider the tablet as instrumental, although their positive attitude is strongly linked to the expectation of having a more enjoyable learning experience.

KEYWORDS

Mobile learning, tablet computer, secondary education, Theory of Planned Behavior.

1. INTRODUCTION

In the digital age, technology cannot be ignored, especially in education. Continuous efforts are made to improve and support computer-assisted learning, integrating mobile technologies such as tablets and smartphones in education settings (Alvarez, Brown, & Nussbaum, 2011). The growing interest is understandable. Mobile technologies are flexible, students own the device and have control of the learning process. As such, mobiles technologies offer novel possibilities to enhance the learning environment (Melhuish & Falloon, 2010).

In this paper, we report the results of a study into the expectations towards the introduction of personal tablet computers (i.e. the Apple iPad) in a secondary school in Flanders, Belgium. At the beginning of the school year, all students and teachers owned a personal tablet to be used in both class and home environments. Although preliminary research corroborates the potential of tablets in education, supporting motivation and collaboration (Alvarez et al., 2011; Kinash, Brand, & Mathew, 2012, Zhang & Betts, 2012), such a disruptive implementation or an innovation also might bring about skepticism, or even resistance. For example, opponents in the public debate can point to the alleged hype-factor, financial burden, and question the actual motivational and supportive ability of tablets in education. As such, it is imperative to be able to rely on a solid support for such an introduction, to know what the reasons for this support are, and to be able to meet up with the expectations they bring along. Mobile devices such as tablet PC's could students help to learn independently from time and space and can foster learning. Students have always their library nearby where they have access with the whole world wide web. However, to realize the benefits of mobile learning, first students and teachers have to accept and adopt mobile learning (Cheon, Lee, Crooks, & Song, 2012). Because the availability of tablet PC's does not imply learning will happen, we must explore the acceptance

and perception of such devices in education (Corbeil & Valdes-Corbeil, 2007; Keller, 2011; Cheon et al., 2012).

Hence, in this research, we question the extent to which primary stakeholders, i.e. teachers and pupils, in this particular case are in favor of embracing the tablet as a mobile, educational tool, and why that is so. Is it because of intrinsic values, or because the innovation is pushed through by the school's principal decision makers?

2. THEORETICAL FRAMEWORK

To research this matter, we rely on the Theory of Planned Behavior (TPB) as a guiding framework (Ajzen, 1991), moreover the Decomposed Theory of Planned Behavior (Taylor & Todd, 1995). This model with the core concepts of TPB comprises an elaboration of the Technology Acceptance Model (TAM) (Davis, 1989), which is in turn based on the Theory of Reasoned Action. The Technology Acceptance Model (TAM) (Davis, 1989) is a model, which explains how users accept and use a technology and has the purpose to predict the acceptability of a tool. TAM's conceptual underpinning is that the attitude towards a technology originates in the recognition of the technology as useful and easy to use. The TPB extends this notion in multiple ways. First of all, it also includes subjective norm, reflecting social influence to accept a technology, as well as perceived behavioral control, i.e. the sense to master the new technology. Hence, the TPB is highly suitable for situations in which users do not have complete control over what they are supposed to do. Secondly, TPB does not solely rely on the beliefs users have about the attributes of an innovation, but instead weighs them with the evaluations of these very same attributes (Taylor & Todd, 1995). The TPB has been applied in various contexts such as technology and health care (Cheon et al., 2011). Yet, Taylor and Todd (1995) stated that those who are looking for a more comprehensive perception of intentions should use the decomposed theory of planned behavior model. This extended model of the TPB gives a deeper insight into beliefs systems that contribute to classroom computer usage issues (Smarkola, 2008).

In the present study, we first question to what extent the core concepts of the TPB explain the intention of both teachers and pupils to use the tablet for school. That is, (RQ1) what is the relative extent to which attitude, subjective norm and self-efficacy explain variance in the behavioral intention of both stakeholders? Next, the substrate of the attitude and subjective norm are examined. We explore (RQ 2) the extent to which both instrumental (i.e. perceived usefulness and perceived ease of use) as well as more affective factors (i.e. status and perceived enjoyment) explain attitude. Finally, we look into the origins of subjective norm, (RQ 3) inquiring the extent to which other stakeholders exercise influence.

3. METHODOLOGY

The present study took place in a secondary school in Flanders, including 83 teachers and 694 pupils. At the beginning of the school year, each respondent purchased a personal tablet to be used at school as well as at home. The present survey, which is part of an ongoing longitudinal research project, was administered at the first day of school and hence concerns teachers' and pupil's expectations towards using the tablet. The data were collected through an online questionnaire on the respondents' personal tablet device. The survey draws upon prior applications of the decomposed theory of planned behavior. Besides socio-demographic details, it contains measures of attitude ($M_t = 3.84$, $SD_t = .83$, $\alpha_t = .95$; $M_p = 3.46$, $SD_p = 1.01$, $\alpha_p = .91$), subjective norm ($M_t = 3.18$, $SD_t = .90$, $\alpha_t = .95$; $M_p = 3.15$, $SD_p = .84$, $\alpha_p = .83$), controllability (i.e. self-efficacy), and behavioral intention ($M_t = 3.80$, $SD_t = .77$, $\alpha_t = .87$; $M_p = 5.80$, $SD_p = .99$, $\alpha_p = .83$). Moreover, these measures were supplemented with lower-level measures of perceived usefulness, perceived ease of use, perceived enjoyment and status for attitude, and influence by the school board, parents, pupils/peers, and colleagues/teachers for subjective norm (See Table 1). The lower-level measures were composed by multiplying beliefs (b) and outcome evaluations items (e). Both beliefs (i.e. the extent one agrees with an attribute) and outcome evaluations (i.e. the extent one considers an attribute important) were measured on a five-point Likert scale. The behavioral intention construct comprised six items, covering studying and tasks in school as well as for homework. Items were measured on five-point Likert scales ranging from 'never' to 'very often'. All measurement items were inspired by previous TPB applications.

Table 1. Descriptive statistics for the lower-level decomposed TPB measures, composed by summing item-wise multiplications of belief and outcome evaluation. These sums were later divided by the number of constituent items. As such, the variables range from 1-25, i.e. 5*5. [+] refers to single-item measures, not requiring a test of internal consistency.

	Teachers' Σb*e			Pupils' Σb*e		
	M	*SD*	α	*M*	*SD*	α
Perceived Usefulness	14.04	4.05	.88	14.13	4.09	.83
Perceived Ease of Use	13.67	4.22	.92	13.64	4.31	.86
Perceived Enjoyment	14.04	5.02	.95	13.49	5.35	.93
Status	6.54	3.59	.88	6.78	3.66	.82
Parents[+]	11.68	3.30	-	12.13	5.31	-
School board[+]	16.96	4.16	-	14.84	5.25	-
Peers[+]	-	-	-	9.16	4.32	-
Pupils[+]	11.87	3.90	-	-	-	-
Colleagues[+]	11.42	3.67	-	-	-	-
Teachers[+]	-	-	-	13.64	4.76	-
Self-efficacy	13.14	4.25	.87	14.94	4.56	.86

4. RESULTS

Before addressing the proposed research questions, we looked into the mean levels of the magnitude of attitudes and subjective norm of both teachers and students. One-sample t-tests, using the scales midpoint as a point of reference indicate that attitude's mean level is significantly higher for both teachers [$t(75) = 8.80$, $p < .001$] and students [$t(681) = 11.78$, $p < .001$]. Feelings of subjective norm are higher for students [$t(681) = 4.65$, $p < .001$], but not for teachers [$t(75) = 1.73$, $p > .05$].

To answer the first research question, considering the extent to which basic TBP blocks explain variance in behavioral intention (Ajzen, 1991), two regression models were computed (Table 2). Attitude, subjective norm and self-efficacy were simultaneously employed as independent variables. The teacher model accounts for a substantial amount of variance (43%) in behavioral intention. Yet, there is only a significant effect of attitude, indicating that teachers' prospective use is solely determined by their attitudes. As such, teachers' acceptance of the tablet appears intrinsically motivated. Social influence appears not to matter, as well as the sense of self-efficacy. The pupil regression model accounts for a substantially lower amount of variance in intention (25%). Nevertheless, all three independent variables contribute to the model. Similar to teachers, attitude is a relatively strong explanatory variable hence indicating intrinsic motivation to embrace the tablet in future educational contexts. However, there are also significant effects of self-efficacy and subjective norm. The former reveals that issues concerning the aptitude of using the technology influence the prospective uptake, an important issue that needs to be taken into account. The latter indicates that regarding pupils, social influence has a minor, yet significant role, albeit to a much lesser extent than the other two tested variables.

Table 2. Multiple regression models with Behavioral Intention as dependent variable.

	Teachers ($R^2 = .43$)			Pupils ($R^2 = .25$)		
	β	*t*	*p*	β	*t*	*p*
Attitude	.54	3.94	.000	.34	7.55	.000
Subjective Norm	.09	.80	.424	.08	1.88	.061
Self-Efficacy	.10	.87	.385	.17	4.30	.000
F(df)	18.45 (3, 72), $p < .001$			76.35 (3, 678), $p < .001$		

Next, a second set of regression models were computed to test the explanatory performance of classic TPB measures of perceived usefulness and perceived ease of use in explaining attitude (See Table 3). As previously mentioned, this is the most important factor in explaining behavioral intention. As argued in the introduction, perceived enjoyment and status were added to the equation. For teachers, this results in a highly satisfactory amount of variance accounted for (59%) in the attitude measure. Nevertheless, only independent variables with a direct instrumental nature proved as significant indicators, i.e. perceived usefulness and perceived ease of use. The pupil model renders a similar variance-accounted-for (60%). However, it is the perceived enjoyment measure that yields the strongest effect, followed by perceived usefulness, status and

perceived ease of use. This suggests a mixture of both prospective pleasure and utility. As such, the teacher and pupil model relatively mirror each other.

Table 3. Multiple regression models with Attitude as dependent variable.

	Teachers ($R^2 = .59$)			Pupils ($R^2 = .60$)		
	β	t	p	β	t	p
Perceived Usefulness	.33	2.12	.037	.31	8.46	.000
Perceived Ease of Use	.32	2.76	.007	.12	3.48	.001
Perceived Enjoyment	.12	.89	.379	.41	11.53	.000
Status	.15	1.71	.092	.06	2.23	.026
F(df)	.59 (4, 71), $p < .001$			249.82 (4, 677), $p < .001$		

Finally, the third research question is addressed by computing two additional multiple regression models (See Table 4). As previously found, subjective norm has no effect on the behavioral intention of teachers. Hence, it does not play a role in the decision to accept the tablet in their work practice. Moreover, it shows that their conception of subjective norm does not originate in any of the supposed relevant stakeholders in the school's ecosystem, i.e. pupils and their parents, the school's board and teachers' colleagues. In fact, the closest candidate is the influence of colleagues, which is marginally significant. More interesting is the pupil model, accounting for one-third of the variance in subjective norm. As noticed in the previous analysis, social influence exercises a minor, yet substantial role. A correlational analysis reveals that all four tested factors are significantly related to pupils' subjective norm ($r = .33-.55$, $p < .001$). Still, when simultaneously implemented in a single regression model, the peer and parental influences prevail. This indicates that despite the institutional push by the board of directors and teachers, what really matters in supporting the uptake of the device for school, are the social actors closest to the pupils.

Table 4. Multiple regression models with Subjective Norm as dependent variable.

Teachers ($R^2 = .13$)				Pupils ($R^2 = .33$)			
	β	t	p		β	t	P
Pupils	.09	.56	.577	Peers	.17	4.62	.000
Parents	-.04	-.25	.807	Parents	.47	11.41	.000
Directors	-.03	-.26	.796	Directors	-.02	-.47	.637
Colleagues	.34	1.83	.071	Teachers	.04	.80	.424
F(df)	2.54 (4, 71), $p < .05$			F(df)	83.48 (4, 677), $p < .001$		

5. DISCUSSION AND CONCLUSION

This study shows that, as for this specific case, both teachers and pupils generally have positive attitudes towards tablets. As such, both express great expectations for using them in class and beyond. Those findings are in line with previous research discussed in the introduction. Still, there are apparent differences concerning the substrate for behavioral intention. Subjective norm does not play a role in teachers' acceptance, as they are uniquely intrinsically motivated, through their attitude. This attitude is especially made up by instrumental considerations on the usefulness and ease of use of the tool. Students on the other hand do report a minor influence of subjective norm, indicating that they feel somewhat pushed to embrace the technology. Surprisingly, it is not so much the school that accounts for this, as much as peers and parents do. Nevertheless, the pupils' positive attitude is a stronger factor. Unlike their teachers, pupils mix instrumental considerations with more affective ones, especially the prospect of enjoying working with the tablet. However, this high expectation introduces a major challenge for the success of using the tablet. There is a vast opportunity of motivating pupils, introducing more joy into the learning experience, albeit on the conditions that the actual appropriation will have to live up to the beliefs of having a nicer learning experience.

This challenges teaching practices and the (further) development of learning materials. Venues for further research are manifold. First of all, we plan to complement this study with supplementary waves of data collection, probing actual experiences during the school year, thus adding a longitudinal component. Second, we plan to engage in ethnographic research, examining hands-on experiences from both pupils and teachers and to explore new possibilities of using mobile devices like tablets in secondary education.

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