THE EFFECT OF COLLECTIVE EFFICACY ON TEACHERS' TECHNOLOGY ACCEPTANCE.

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ABSTRACT

This investigation of teachers computer use prompted by a 1999 Provincial Assessment finding that students were performing below Provincial expectations in use of the World Wide Web / Internet and identification of teachers as students greatest source of computer knowledge. It was found that the majority of teachers have the necessary knowledge and skills to use computers in the classroom, but teachers predominantly used computers for personal and general purposes. It was also found that teachers represent a large source of influence on their colleagues' computer knowledge and skills. This influence, defined through the construct of collective efficacy, was found to differ between schools with higher and lower levels of collective efficacy in their perceptions of the image portrayed by using the World Wide Web / Internet in the classroom. Teachers in schools with high and median levels of collective efficacy were found to differ significantly from teachers in schools with lower levels of collective efficacy in the potential status a teacher may obtain within their school from using the World Wide Web / Internet.

Additionally this study offers support for Venkatesh and Davis (2000) theoretical proposition that the image construct is less susceptible to the influence of experience an individual may have with a particular computer application. However due to small sample size of this study these results must be interpreted cautiously.

ACKNOWLEDGEMENTS

I would like to thank my supervisor for the patience and humor he has demonstrated through the course of this thesis. I would also like to thank my committee for their insightful comments. Primarily I would like to thank my wife, Cindy, for her patience and support in the face of my extended evenings and weekends working through the challenges this thesis presented.

DEDICATION

This thesis is dedicated to my wife, family, friends, colleagues and teachers for assisting me in the continuation of a lifelong pursuit of the ever elusive question of **why**.

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CHAPTER 1

Introduction

> When the automobile was invented, some people feared that our hearts could not stand the pressure resulting from high-speed traveling. When tunnels were constructed for trains, some people said that passengers could be killed inside the tunnel due to the lack of oxygen. Those people still insisted that riding horses was the only proper means of transportation.
> (Yu, 1997).

This quote provides a focus on the main topic under investigation in this thesis, the resistance to change, specifically the resistance of those 'riding horses' in the face of the new technologies, such as, computer technologies. Resistance to computer systems is a widespread problem and one of the most challenging areas in information systems research (Davis, Bagozzi & Warshaw, 1998). This raises a question as to why individuals reject computer technology and how to develop a greater understanding of the variables influencing such rejection. Specifically for this study the resistance to computer technology in the teaching profession was examined through investigation of differing high schools collective efficacy's influence on teachers' computer acceptance levels.

Teachers' perceptions of computer technology was an area needing investigation. For example, in the fall of 1999, under the Provincial Learning Assessment Program, a province wide assessment was conducted to examine technological literacy involving 3500; grade 5, 8 and 11, students from 182 schools. The preliminary report indicated that Saskatchewan students' technology literacy is below provincial expected levels and most students do not have the chance to become technologically literate through computer use in schools. It was pointed out that "the largest discrepancies between student performance and provincial expectations occurred in activities involving the Internet, and the accessing, processing, and communicating of information" (Saskatchewan Education

Indicators [SEI], 2000, p. 53). The reason use of the Internet was a major source of concern was that students who did use the Internet performed significantly better in other areas of the technological assessment (SEI, 2000). This suggests that students who have a greater familiarity with the Internet, overall, may have greater computer related skills than other students. Additionally, less than provincial expectations of Internet use in high schools seemed to contradict a recent Statistics Canada report. The report stated the province's schools are national leaders in utilizing one of the fastest means of Internet connections: broadband technologies, and 97% of secondary schools computers connected to the Internet (Ertl & Plante, 2004). This suggests that an examination of computer skills in the Saskatchewan school system through an investigation of Internet use is a crucial element to greater understanding of computer use in Saskatchewan.

The provincial study identified students' homes and parents as a source of support for learning computers but teachers as the major source of their computer knowledge. The results indicated that 87% of students' computer knowledge comes from their teachers (SEI, 2000). Students' identification of teachers as their largest source of computer knowledge combined with provincial findings of students' lessened levels of technology literacy suggests an investigation of teachers' use and acceptance of computer technology. That is the area this study addressed through an examination of high schools' collective efficacy and its influence on teachers' computer acceptance.

Problem Statement

It is clear that technology is becoming an important part of education and teachers are seen as a crucial link in developing computer literate students (Manternach-Wigans, 1999; Phelps, 2002). Provincially, students identified teachers as their greatest source of

computer knowledge and by this determined that understanding teachers' relationship to computer technology must be the initial step to understand students less than expected level of computer usage. Past research supports this finding. Delcourt and Kinzie (1993) stated teachers have the greatest impact on students in the development of computer skills and attitudes. However, teachers do not operate in isolation. Teachers are part of an interactive social system; the school system they are a part of, which shapes them as they shape it (Bandura, 1997). The influence of this system and its effect on teachers' computer acceptance cannot be overlooked. Therefore the investigation in the current study is that of the factors influencing teachers' general and professional use and acceptance of computer technology and, more specifically, the Internet.

Research Question

The purpose of the study was to investigate the factors influencing teachers' general and professional use and acceptance of computer technology. To answer this primary question it first had to be established that teachers have the skill and knowledge and are using computer technology. This led to the following subquestions:

(1) Do high school teachers have the computer skills and knowledge to use computers in the classroom?

(2) How are high school teachers using computer technology?

Sources influencing teachers' perceptions of computer technology were addressed through the following subquestions:

(3) What are the sources of high school teachers' computer knowledge and skills?

(4) Do high school teachers influence their colleagues' computer knowledge and skills?

The degree of influence teaching colleagues may play on teachers' acceptance of computer technology in the classroom was addressed in the following subquestion:

(5) Do teaching colleagues, defined as a high school's collective efficacy, influence teachers' perceptions of computers, specifically the World Wide Web / Internet in the classroom?

Teachers' technology acceptance was operationalized through Venkatesh and Davis' (2000) technology adoption model, the Technology Acceptance Model 2 (TAM2). The TAM2 combines measurement of social and cognitive influences on potential computer users with users' perceptions of the perceived usefulness and of their intentions to use a computer system to understand the conditions for adopting a computer system.

Delimitations of the present study

This research looked at one source of influence on students' computer acceptance, teachers. Other sources of influence such as parents were not included due to students previously identifying parents as a source of support but not a source of computer knowledge. Additional staff influence within schools was not investigated due to students defining teachers and not the school staff in general as being the largest influence on their computer knowledge. Influence on teachers' perceptions of computer technology was defined as the collective efficacy of teaching colleagues within individual schools.

Definitions

Self-efficacy – a construct derived from Social Cognitive Theory. The theory proposes that behavior is the result of the interaction of a triadic reciprocal causation model in which behavior, cognitions and the environment all influence each other in a dynamic fashion (Bandura, 1986, 1997). Self-efficacy is defined as judgments of personal

capabilities, not necessarily the skills an individual has but rather the judgments of what one is capable of doing with the skills they do possess (Bandura, 1997). Bandura (1997) differentiates between the concepts of self-efficacy and self-esteem and locus of control. He distinguishes the three by defining self-efficacy as judgments of one's capabilities, self-esteem as judgments of liking or disliking ones-self, and locus of control as a belief of whether actions affect outcomes.

Collective efficacy – "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 477).

Perceived usefulness – "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320).

Perceived ease of use – "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320).

Summary

This chapter has presented an introduction of the rationale for a study of the factors influencing teachers' perceptions of computer technology. Students recognition of teachers as their greatest source of computer knowledge combined with their diminished levels of technology literacy prompted this study of teachers' perceptions of computer technology. The following chapter will outline the following in a more detailed fashion: (a) review the literature and establish rationale for the present research, (b) a discussion about research traditions in an academic context, (c) an overview of Bandura's (1986) Social Cognitive theory and it's evolution into the construct of collective efficacy and (d)

the acceptance of computer technology will be explored through a review Davis's (1986) Technology Acceptance Model 2.

The following chapters will present the sequence of stages undertaken in completing this study. Chapter 3 will present the research design and instruments utilized in this research, the sample selection criteria and the data collection procedures employed. Chapter 4 will present data analysis results from the five research subquestions and chapter 5 will present the interpretation of these results and implications of this study for further research.

CHAPTER 2

Literature Review

The purpose of this chapter is to present the theoretical framework and relevant research which provided the rationale for this study. The first section summarizes research demonstrating the potential of teachers' self-perceptions to influence their students' perceptions of self and abilities. The second section traces the evolution of research on Bandura's (1997) constructs of self-efficacy and its evolution into the construct of collective school efficacy. The final section will review the theoretical underpinnings of Venkatesh and Davis' (2000) Technological Acceptance Model 2 (TAM2) that allows analysis of acceptance of computer technology.

Educational Research Traditions

The effect of teachers' expectations on students has a long history in the educational research tradition. Historically two major approaches have evolved to study this effect. Early researchers investigated the extent to which teachers' expectations about their student were being fulfilled, that is, investigating if teachers were seeing the academic performances from students that they expected (Brophy, 1998). This line of research evolved into investigations of the influences of teachers' individual expectations on teaching practices and student outcomes (Brophy, 1998). In the following sections previous research demonstrating the influence of individual teacher beliefs on students' mathematical ability will be reviewed and prior research will be examined to trace the evolution of the concepts of self-efficacy, collective efficacy and technology acceptance.

Teachers' influence on their students' mathematical abilities

Previous research has demonstrated that teacher's belief in their own abilities

influences students' self- concepts. Teachers' belief in their own abilities to teach specific subjects; such as math, has been show to influence individual teaching style and attitudes, and through these influence components of their student's self-concepts. Relich (1996) demonstrated elements of student self-concept: levels of math anxiety levels and attitudes towards math education, and choices about academic courses and careers to pursue can be influenced by teachers' self-beliefs.

Researchers have demonstrated that variables such as teacher's anxiety levels towards teaching math can affect not only elements of their students' self-concepts but also elements of the individual teacher's teaching style. Wismath (1999) found evidence that students demonstrate a specific content anxiety for mathematics classes that they do not demonstrate for other academic subjects. Relich (1996) furthered this by discovering that teachers with differing levels of math anxiety demonstrate different teaching styles and these differing teaching styles can affect student self-concept. Teachers with high levels of math anxiety have a more traditional, that is, a teacher orientated approach to teaching math. Their teaching strategy is to teach with a more rule oriented approach, that is, a *how* to get the right answer approach (Relich, 1996). Teachers with less math anxiety valued understanding the concepts and process more and they instruct with more of a *why* an answer is correct focus (Relich, 1996). Relich also found that teachers displaying differing levels of anxiety also displayed types of attitudes towards both teaching and their students. Teachers with high math anxiety reported feeling (a) math was not as relevant to life in general, (b) complained of a lack of resources and time, (c) viewed female students as having less mathematical abilities, and (d) had lower expectations for all their students than teachers with lower math anxiety levels. Teachers with low math

anxiety (a) related math to real life situations, (b) took it upon themselves to invent math lessons, and (c) viewed all students as equal in terms of their ability to achieve (Relich, 1996).

Difference in teacher attitudes towards the learning ability of the genders has been demonstrated to influence teacher-student interactions and effect students' mathematics confidence levels. Becker (1981) found that teachers regardless of their own gender encouraged male and female students differently. Based on the gender of the student, teachers encourage boys more than girls in mathematics classes and interacted slightly more with male students (Leder, 1986). This created what Tobias (1993) labelled as "math insiders" and as "math outsiders" (p. 46). With math insiders: males, being seen as taking greater risks and valuing understanding why an answer is correct more than the process while math outsiders: females, were characterized as being more cautious and eager to conform to math rules: the how, and more interested in finding the right answer (Tobias, 1993). Due to a belief in lesser mathematical ability of female students; teachers were interacting and encouraging female students to a lesser degree and creating students more anxious about their math abilities: more worried about getting the correct answer and less interested in understanding the process. This influence has been demonstrated to influence life choices: to pursue mathematical related subject in school, and later in life career choices, influencing males towards and female students away from math related careers (Hyde, Fennema, Ryan, Frost & Hopp, 1990 as citied in Wismath, 1999).

There is evidence that a teacher's subject anxiety and self-concept can affect student performance in subject specific areas such as math. An area of concern yet to be investigated is whether a school, as a collective entity, can influence teacher perceptions

of interacting with computers in the classroom and how this could potentially influence students. The computer classroom interaction that Phelps (2002) suggests teachers predominantly see as "threatening and overwhelming" (p. 1). An investigation of the factors influencing teachers in a school and how this may be affecting teacher variables such as acceptance of computer technology seems to be a logical step into factors that may ultimately be influencing their students' computer acceptance.

Two theoretical developments, self – efficacy's evolution into the collective efficacy construct and the development of the Technology Acceptance Model allow investigation factors possibly influencing teachers acceptance of computer technology. The following section will trace the evolution of self efficacy into the construct of collective efficacy. This will be followed by a review of Davis' (1989) Technology Acceptance Model (TAM), the constructs of perceived ease of use and perceived usefulness he uses to measure technology acceptance, and TAM's integration of a social dimension of technology acceptance to evolve into the Technology Acceptance Model 2 (TAM2).

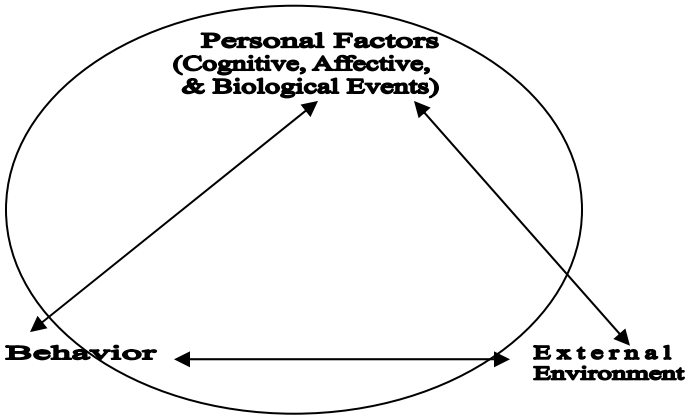
The evolution of self-efficacy and collective efficacy

Review of the Self-Efficacy construct

Albert Bandura departed from behaviorist explanations of human behavior and proposed his own theory which continues to evolve. Bandura rejected the proposition children learn through operant conditioning and reinforcement, and proposed his Social Learning Theory in which suggested that children learnt by watching the behavior of another person (Pajares, 2002). Bandura's original theory evolved into his, 1986 Social Cognitive Theory with his inclusion in his theory of cognitive elements. Bandura proposed that an individual possesses cognitive elements that they use to control

themselves and their environment. Bandura proposed in his original Social Learning Theory in 1977 that “individuals create and develop self-perceptions of capabilities that become instrumental in deciding which goals they will pursue and the control they exercise to achieve these goals” (Pajares, 2002, p. 6). In 1986, Bandura elaborated on this view in his reformulation of his theory into his new Social Cognitive Theory. In his Social Cognitive theory he emphasized the role of “self-referent beliefs” (Pajares, 2002, p. 3). The two key elements of these beliefs were (a) an “agentic sociocognitive perspective” and (b) a “self-referent phenomena” (Pajares, 2002, p. 6). Bandura (1989) defined the agency aspect of his model as being a “model of emergent interactive agency,” (p. 1175) meaning that people are self-organizing, proactive and self-regulating. This self-referent element he defined as beliefs that allow individual’s to exercise a limited amount of control over their thoughts, feeling and actions (Pajares, 2002). Bandura (1989) emphasized that people are neither autonomous agents, being completely independent in their actions of external influences nor “mechanical conveyers of animating environmental influences being completely influenced by environmental sources” (p. 1175, refer to this article for a further discussion of these different types of human agency). Bandura depicted humans as making causal contributions to their own motivation and action, within a triadic reciprocal relationship in which humans are both creating and are the creation of their environments (refer to Figure 1).

Figure 1 – Triadic Reciprocal Causation model of individual motivation and action.[1]



These determinants do not all have equal strength to influence the others but will vary at different times and for different activities (Bandura, 1997). Bandura (1997) subdivided internal or personal factors into the three components of cognitive, affective and biological.

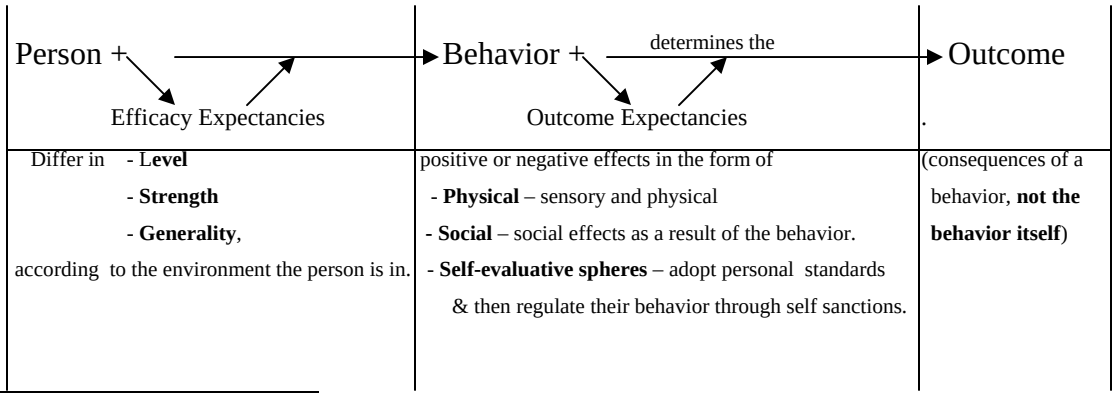
Bandura proposed, human beings are neither the products of their environment nor their biology, but instead are the result of a "dynamic interplay between the external, the internal and our current and past behavior" (Henson, 2001, p. 3). Individuals engage in a behavior, interpret the results of that behavior and use this interpretation to create and develop beliefs about their capacities to perform similar behaviors in similar circumstances, these beliefs influence them in subsequent similar situations in terms of motivation and endurance in the face of differing levels of challenge (Bandura, 1977). Bandura (1997) labeled these beliefs as self-efficacy beliefs. Stressing the importance of self-efficacy beliefs, he suggested the beliefs an individual has in his or her capabilities were more critical elements in determining their motivation and a better predictor of their behavior, than their actual knowledge, prior performance or and skill level. Bandura and Cervone (1983/2000) suggested that a person's self – belief in his or her own capabilities

[1] Adapted from Bandura (1997, p. 6).

was a key component in defining both their behavior and motivation in the face of future, differing, challenges.

Bandura (1986) suggested that the pivotal concept, self-efficacy, was comprised of three basic elements (a) behavior, (b) internal factors and (c) the external environment, and two types of expectancy beliefs (a) outcome and (b) efficacy expectations. Bandura (1997) defined efficacy expectancies as "a judgment of one's ability to organize and execute given types of performances," (p. 21) while outcome expectancies were defined as people's "judgments of the likely consequence such performance will produce," positive or negative (p. 21). Bandura (1986) suggested that combined the two types of expectancy beliefs and the three basic elements would be the best predictors of an individual's behavior in, and affect on, their social system. The ideal combination of these would be if an individual believes he or she can successfully perform a behavior, and believe that the behavior will result in a desired result. This ideal combination would result in a greater effort being expended for a longer amount of time. Bandura (1997) further proposed that a causal relationship between these two expectancies would result in the regulation of human behavior (refer to Figure 2), and this regulation would result in 4 alternative situations (refer to Table 1).

Figure 2 – Expectancies Regulation of Human Behavior (Bandura, 1997) [2]



[2] Adapted from Bandura (1997, p. 22).

As Bandura (1997) suggested, the environmental or the social system that an individual is part of also plays a role in influencing efficacy and outcome expectations. Social system features that are of particular importance are the *opportunities* and the *constraints* that the particular social system place on an individual inside it, in terms of outcome expectancies that he or she can and cannot expect in that particular environment (Bandura, 1997). Bandura (1997) proposed that differing efficacy belief patterns, when combined with differing outcome expectations would produce varying types of behavior and affect reactions. (Refer to Table 1).

Table 1 – Behavioral reactions produced by differing efficacy and outcome expectancies combinations.

		Outcome Expectancies within a Social System[3]	
		Environmental Features	
		Negative environmental – disincentives	Positive environment - incentives
High Efficacy	Behavior	Intensify effort to change environment to get valued outcome.	Active Performance to get positive outcome.
	Example	Protest, Grievance, Social activism.	Ambition Sense of fulfillment. Personal satisfaction
Low Efficacy	Behavior	Little effort and give up quickly when they cannot produce the desired results.	Miniscule effort
	Example	Resignation Apathy	Self-devaluation Despondency Cognitive debilitation of performance.

[3] Bandura (1997, p. 20).

Sources of self-efficacy

Bandura (1997) proposed that individuals form their self-efficacy beliefs from four principle sources (a) mastery experiences, (b) vicarious sources, (c) verbal persuasion and (d) physiological information. The primary source for the development of self-efficacy is a person's mastery experience, or the "interpreted results of one's previous performance," which serves as an indication of their present and future capabilities (Pajares, 2002, p. 7). The interpreted results of an activity serve as an indication of one's capability of succeeding at similar activities, in similar circumstances. An individual performs an activity, interprets the results and develops beliefs about their abilities to succeed at similar activities, and then acts in a manner that coincides with this new belief in similar situations. But, as Bandura (1995) cautions, creating a "resilient" sense of efficacy is not achieved solely through successful mastery experiences or reproducing successful habits (p. 3). "Rather, it involves acquiring the cognitive, behavioural, and self-regulatory tools for creating and executing appropriate courses of action to mange ever-changing life circumstances" (Bandura, 1995, p. 3). Success, partial success, and failure all provide information about the skills an individual possesses. Failure and partial success may be more important than success in the development of a strong sense of self-efficacy due to the experience gained in overcoming obstacles through sustained efforts (Pajares, 1996). Bandura (1995) further suggested that difficulties and setbacks teach an individual that success usually requires sustained effort and after realizing this, an individual when confronted with a difficult situation will persevere longer and rebound quicker from the challenges.

In addition to developing self-efficacy beliefs based on interpretation of their own actions, Bandura (1997) suggests that people develop self-efficacy beliefs through watching others perform tasks. He labelled this second source of creating and strengthening self-efficacy beliefs as "vicarious experience" (Bandura, 1995, p. 3). Bandura (1997) proposed that vicarious experience is mediated by two factors (a) experience with a task and (b) perceived similarity to the individual modeling the behaviour. If an individual is uncertain of his or her own ability or has little prior experience with a task with which to judge his or her own capabilities to successfully perform that task then watching another, similar person, perform the task will allow them to assess their own ability to perform a similar task (Bandura, 1994). Seeing a model, judged as similar to them, succeed at a particular task raises an observer's belief that he or she also has the capabilities necessary to perform the same task successfully, alternately, if the model fail despite a great deal of effort the observer views this as an indication of his or her own lack of ability which undermines the observer's efforts in similar, future situations (Bandura, 1994). Conversely, the greater the perception of dissimilarity with the modeling individual, the lesser the influence on the observer's own efficacy beliefs in their ability to succeed in similar, future situations. Bandura (1997) further defined modeling as not just "a process of behavioural mimicry" (p. 93). He suggests that as well as conveying rules for "generative and innovative behaviour," people also learn thinking skills and how to apply the rules and strategies the model uses as the modeling individual reaches a solution (p. 93). Bandura (1997) stresses prior negative experience of a situation will not necessarily negate the effects of successful social modeling. He suggests modeling that demonstrates effective coping strategies in

the face of an obstacle can help increase belief in one's own capabilities in similar situations.

Verbal or social persuasion from another is the third source of creating or strengthening an individuals' self-efficacy. A person's belief in their own capabilities will be strengthened if someone who is seen as important or significant expresses faith in that person's ability to succeed (Bandura, 1997). This source of self efficacy however is mediated by two factors that contribute to its strength (a) the credibility of the person trying to persuade them; the persuader must be seen as either having greater authority, experience or status than themselves, and (b) the situation must be realistic (Bandura, 1995). Bandura (1997) warns that this potential source of self-efficacy development must not include flattery or anything that raises unrealistic belief in one's own capabilities. Either of these will lead to the individual failing, resulting in a discrediting of the source of the persuasion and undermining the individuals' belief in their own capabilities in similar, future situations. If a person can be persuaded verbally that they can succeed at a given task, and the persuasion is neither flattery nor unrealistic and is from a person deemed as credible or of greater status, then the persuaded person will put greater effort into completing the task and upon succeeding will strengthen their belief in their own capabilities.

The final source of self-efficacy is the perception and the interpretation of physical and emotional states (Bandura, 1997). People will judge their confidence to perform an action based on the emotional state they experience as they contemplate an action (Pajares, 2002). Strong emotional reactions to a task, such as anxiety and stress, give indications of a person's belief in their ability to successfully complete the task.

Negative thoughts and fears lower one's belief in one's ability to successfully perform the task, which results in greater stress and tension that help to ensure a lower level of performance, fulfilling the individual's original negative thoughts and fears (Bandura, 1997). An individual's interpretation of his or her emotional states has also been shown to influence his or her self-efficacy perceptions. While a positive mood will enhance an individual's self-efficacy: A negative mood will diminish it (Bandura, 1995).

Once formed, Bandura (1995) proposed self-efficacy beliefs would influence human behaviour through four major processes: (a) cognitive, (b) motivational, (c) affective, and (d) selection processes. Self-efficacy shapes cognition through influencing thought patterns about future events that can either be individually self-aiding, such as viewing a situation as presenting achievable opportunities, or individually self-hindering, such as dwelling on personal deficiencies. Bandura (1994) suggested initially that individuals organize actions in terms of an anticipatory scenario. In the scenarios individuals who have a high sense of self-efficacy will visualize success that provide positive guides and supports for their performance in the actual situations. Those with a lower sense of efficacy will grow erratic in their analytic thinking, lower their expectations and the quality of their performance in the actual situation will deteriorate (Bandura, 1989). Self-efficacy plays a role in influencing the motivational processes through the amount of effort an individual will exert and how long they continue working at a task in the face of obstacles. Those individuals with lower self-efficacy about a particular task will undermine their own motivation by dwelling on their potential inability to succeed at the task, before the task is attempted. The influence of self-efficacy on affective processes can be seen in the level of stress and depression an individual

experiences in threatening or difficult situations (Bandura, 1997). Self-efficacy further influences selection processes by affecting the choice of tasks attempted by an individual and the choice of environments in which an individual believes they can successfully complete the task (Schunk & Pajares, 2002). Individuals will avoid environments or situations they believe exceed their capabilities and engage in situations they believe they can handle. The influence of environment on an individual may be seen most clearly in the form of the influence of collective efficacy on a person.

Bandura (1997) stresses that self-efficacy does not operate independently of the social system in which the individual is involved in. Indeed two of the sources of self-efficacy: vicarious sources and verbal persuasion both depend on interaction with another person. He suggests that social structures represent a reciprocal relationship between those in charge of the system and those within the system, the relationship between the two cannot be depicted as a relationship between a "disembodied social structure and a decontextualized personal agency" (Bandura, 1997, p. 6). A social system places various rules and regulations upon its members and the individual member choose how they will react to those rules and regulations based on personality factors, such as their individual levels of self-efficacy. Bandura (1997) suggested that individuals with higher levels of self-efficacy would display greater abilities to utilizing opportunities in the system and either change or circumvent obstacles, while those with lower self-efficacy would be less able to take advantage of opportunities in the system and would become discouraged by obstacles more easily. Additionally, as individual members within the group interact and coordinate their activities to accomplish group goals or objectives, an emergent property

greater than the sum of the individual attributes of the individuals within the group develops which Bandura (1997) called collective efficacy.

Collective Efficacy

While similar to individual efficacy collective efficacy has some pronounced differences that render it more than just a culmination of the differing attributes of individuals within a group (Bandura, 1995). While encompassing the individual self-efficacy components of (a) influencing task choice and performance, (b) level of effort expended, (c) persistence at tasks, (d) importance of others, and (e) stress levels and achievement, collective efficacy incorporates group dimensions into its' definition. Instead of merely combining individual characteristics into a singular encompassing representation of a group the definition of collective efficacy includes how well group members work together and how much they can accomplish together. Bandura (1997) defined collective efficacy as the belief of group members about "the performance capability of a social system as a *whole*" [italics added] (p. 469). Factors that contribute to collective efficacy of a group are the mix of knowledge and competency levels in the group, and the structure of the group (Bandura, 1997). The type of leadership also plays a role in how collective efficacy influences group characteristics, such as (a) how group activities are coordinated, (b) how group efforts are guided and coordinated, and (c) strategies its leaders use. The extent to which group members work together or try to undermine one another also plays a role in either creating or diminishing collective efficacy. It is the beliefs in the groups' ability as a single entity to succeed at a task that makes collective efficacy an emergent property of the entire group rather than the culmination of the individual beliefs of its members (Bandura, 1995).

Goddard, Hoy and Woolfolk (2000) suggested a school system represents a collective social system in that as a collective entity it has specific perceptions about the faculty's ability to organize and execute courses of action that will result in a positive effect on their students. Bandura (1997) suggested that teachers form perceptions about the "conjoint capability of the faculty" of which they are a part of and these perceptions will vary greatly among schools and can be systematically associated with school elements, such as student achievement (p. 498). He further suggested that differing school systems would consistently display characteristics reflective of either high or low efficacy beliefs. This prompts the question, does the collective efficacy influence teaching elements of a school such as teachers' perceptions of computer technology.

An investigation of the teachers' computer acceptance and integration, prompted by the less than expected adoption rate of computers by Saskatchewan students, must include an investigation of the effect the of school factors, such as collective efficacy, are having on teachers. The theoretical underpinnings and current research on collective efficacy will be reviewed next.

Bandura (1997) built upon his original self-efficacy construct when he recognized the social influence that group membership has on individual self-efficacy. Central to Bandura's (1997) social cognitive theory is the definition of self-efficacy as "beliefs in one's capabilities to organize and execute a course of action required to produce a given level of attainment" (p. 3). Furthering this definition Bandura (1997) placed efficacy in the context of not only an *individual*, but also a *group* attribute when he suggested that "personal agency operates within a broad network of socio-cultural influences" (p. 6) that places the individual under the influence of the "collective agency" of the group they are

members of (p. 7). Teachers' collective efficacy means that an individual teacher's sense of efficacy is influenced by external, collective, factors such as other teachers, principals, other school staff, and even the students in the school themselves.

Teaching is an occupation performed individually within a group context, with the goal of impacting the lives of students. With Bandura's (1997) recognition that the social context of the school itself is an important element in influencing teachers' perceptions and beliefs, the influence of this context should be included in a study of the factors influencing teacher's perceptions and reactions, such as their acceptance or rejection of computer technology.

Bandura (2001) stressed that efficacy does not operate independent of the social system the individual is involved in and indeed that the system mirrors to an extent the individuals it encompasses. He suggested that social structures represent a reciprocal relationship between those who are in the system and the system itself. Situational characteristics influence individuals within the system, in terms of their thoughts, which in turn influence their behaviors, their successes or failures at various task, which subsequently influence beliefs about their individual self-efficacy and beliefs about the capabilities of the group or system of which they are members. Bandura (1997) suggested school systems will display characteristics consistent with either collective levels of high or low efficacy. Similar to individuals with higher levels of efficacy, groups should display greater abilities to utilizing opportunities and either change or circumvent obstacles, while groups with lower collective self-efficacy should demonstrate less ability to take advantage of opportunities and to become more easily discouraged by obstacles they encounter.

The belief systems of school staff members should create a collective sense of efficacy that can either vitalize or demoralize the perceived efficacy of its' individual members. Principals and teachers should display differing attitudes towards their jobs and towards their students consistent with either high or low efficacy patterns prevalent in the entire school. Principals, in highly efficacious schools should act as leaders who would "seek to improve instruction" and "figure out ways to work around policies and regulations that impede academic innovativeness" (Bandura, 1997, p. 214). High expectations and standards combined with learning activities structured and conducted to ensure mastery of the material, promoting a sense of personal capability and accomplishment would be the norm in highly efficacious schools. Teachers in this type of school should (a) set high standards, (b) demonstrate belief in their students' ability to achieve those standards and (c) believe they are partly responsible for their student's success (Bandura, 1997). Low student ability and adverse family conditions would *not* be accepted as reasons for poor academic performance of students in these schools. Classroom behavior in a high efficacy school would be based on recognizing, promoting and praising productive activities rather than punishing disruptive behaviors, the method of controlling classroom behavior in a low efficacy school (Bandura, 1997). Schools with high collective efficacy would accept challenging goals, put forth a strong organizational effort and display a persistence that results in a better performance (Goddard & Hoy, 2001). Principals in low efficacy schools would function as administrators and disciplinarians. Bandura (1997) suggested that teachers in low efficacy schools would "write off a large part of the student body as uneducable, expect little academically of their students, spend less time actively teaching and monitoring the progress of their

students and spend more time as disciplinarians maintaining order in the classroom" (p. 244). Students in this type of school would display a high sense of academic futility (Bandura, 1997). Schools with low efficacy would demonstrate a greater tendency to give up, exert less effort and produce a lower level of performance when faced with a challenge. The staff in such a school would see themselves as powerless to help their students achieve academic success and a sense of academic futility would fill the entire school possibly resulting in a lessened ability and desire by the staff to try innovations such as newer computer programs.

Accordingly, schools displaying differing levels of collective efficacy should also display different types of influence on teachers within their system and this influence should be measurable in terms of teacher's variables such as acceptance or rejection of computer technology. Accurate measurement of collective efficacy is essential to an investigation of the influence of collective efficacy on teachers' efficacy patterns. The following section will discuss measurement issues surrounding the measurement of collective efficacy.

Issues in Measurement of Collective Efficacy

Bandura (1997) suggests that in measuring collective efficacy it is important to determine the wording of items in conjunction with identifying your participants. He suggests that how loosely or tightly coupled the organization is will affect the wording of a measurement instrument. A more tightly coupled organization, Bandura (1997) suggests, is best measured by aggregating members' beliefs in their groups' efficacy, while in a more loosely coupled organization collective efficacy is best measured by combining members' belief in their individual efficacy. In comparison to other

organizations Bandura suggests that schools represent an intermediate level of interdependence, which means school systems could be measured using either method. However, researchers such as Goddard and Hoy (2001) suggested school levels represent differing levels of organizational unity, with elementary schools represent a more tightly united collective due to "shared goals (e.g. to educate all the children) and similarity of responsibilities across teaching positions" (p. 11). While other researchers, such as Firestone and Herriott (1982 as citied in Kurz, 2002), found that high schools and not elementary schools seem to be loosely coupled due to teachers being "relatively unobserved by colleagues and administrators and possess [ing] broad discretionary authority over their students" (Kurz, 2002, p. 9).

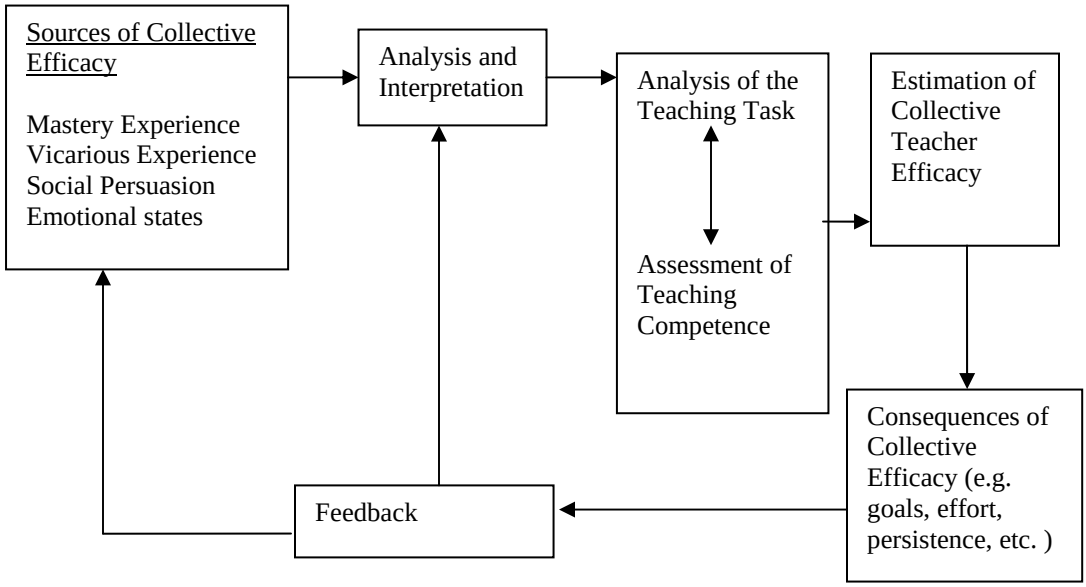
Eclipsing this concern and confusion over structural tightness/looseness of a school may be a group/individual orientation for the item wording. Goddard, Hoy and Woolfolk (2000) suggest that "independent of the degree of coupling, group oriented items reflect the collective experience group members [experience] better than individually oriented items" (p. 12). Additionally, Potter (1992 as citied in Goddard & Hoy, 2000) stated that when "organizational-level aggregates are constructed from individual responses, the individual responses are not independent" rather they are dependent on the influences of group membership (p. 12). So in an investigation of a construct like collective efficacy, items with a group orientation rather than an individual orientation may be the most appropriate items in a measurement device. In addition to a group/individual orientation in item formation, positive/negative wording is also an area of concern.

Researchers such as Hoy (2000) suggested individuals may express different efficacy opinions depending on whether questionnaire items are worded either negatively or positively. Goddard, Hoy and Woolfolk (2000) developed a measurement instrument that addresses these concerns.

Goddard and Hoy (2001) added to Bandura's (1997) four sources of efficacy, (a) mastery experiences, (b) vicarious sources, (c) verbal persuasion and (d) physiological information, the construct of "perceptions of group competence," to move efficacy from the individual to the collective level (p. 9). Goddard (2000) proposed that analysis of teaching task and assessment of teaching competence, are both key elements in the creation of collective teacher efficacy instrument. Goddard and Hoy (2001) suggest that when a teacher analyzes his or her teaching task, they do the analysis at two levels – the individual and the collective. At the school level this equates to the analysis of what would it take for a teacher to be successful in their particular school? While this encompasses a judgment of individual capabilities it also incorporates a judgment about school characteristics, such as "the availability of instructional material, the presence of community resources and constraints, and the appropriateness of the school's physical facilities (Goddard, et al., 2000, p. 10). In terms of analysis of teaching task at the school level Goddard and Hoy (2001) propose this analysis produces "inferences about the faculty's teaching skills, methods, training, and expertise" (p. 10). Goddard and his colleague (2001) also proposed that the analysis of the two constructs, analysis of teaching task and analysis of teaching competence, are done simultaneously, and at the school level, the interaction of these two constructs forms the collective efficacy beliefs of various individual schools.

Goddard and Hoy (2001) utilized previous models and research developed a measurement instrument to measure collective efficacy. Through a combination of Bandura's (1997) theoretical self-efficacy underpinnings with Tschannen-Moran, Woolfolk-Hoy and Hoy's (1998) teacher efficacy model, Goddard and Hoy (2001) develop a model and an instrument, to measure, collective efficacy (refer to Figure 3).

Figure 3 Goddard and Hoy's Model of Collective Efficacy (2001, p. 25)



Theorizing that collective efficacy is not a uni-dimensional construct Goddard and Hoy (2001) adapted Gibson and Dembo's (1984) scale to reflect perceptions of group competence (GC), both positive (GC+) and negative (GC-), and combined this adaptation with perceptions of task analysis, positive (TA+) and negative (TA-), and developed a collective efficacy scale. Utilizing Rokeach's (1960 as citied in Goddard, Hoy and Woolfolk, 2000) 'method of known groups,' they piloted their instrument on 70 teachers from 70 different schools in five different states. Half of these schools were reputed to have high levels of conflict between staff members while the other half was purported to have low levels of staff conflict (Goddard & Hoy, 2001). A total of 46 participants

responded, 24 from low conflict schools and 22 from high conflict schools. Additionally, measures of a teacher's sense of powerlessness (Zielinski & Hoy, 1983), Bandura's (n.d.) teacher efficacy scale and a measure of teachers trust in colleagues (Hoy & Sabo, 1998) were used to provide a validity check on the scale. As they hypothesized both conflict and teacher powerlessness were significantly negatively related to collective efficacy while trust in colleagues and teacher efficacy were both positively related to collective efficacy. The collective efficacy scale was analyzed using factor analysis which revealed that instead of multiple factors such as uncovered with teacher efficacy scale one factor best explained the data of the collective efficacy scale. This coincided with Goddard and Hoy (2001) theoretical model which proposed that instead of being composed of two dimensions, like teacher efficacy with it's two dimensions of teaching competence and task analysis, collective efficacy due to the cognitive processing inherent in the formation of collective efficacy belief would created a combination of perceptions of group competence with task assessment resulting in one efficacy belief (Goddard & Hoy, 2001).

Additional research provided further support for this measurement device. Further testing with a larger sample, teachers from 47 elementary schools, produced similar, validity and uni-dimensional results. An additional study investigating the relationship between collective efficacy and student achievement in reading and mathematics discovered that "collective teacher efficacy is a significant predictor of student achievement in both mathematics and reading achievement," (Goddard & Hoy, 2001, p.20). Consistent with Bandura's (1993) assertion the affect of collective efficacy was stronger than socioeconomic status (SES), the affect of collective efficacy was found to be more predictive of elementary students reading; 53%, and mathematics; 70%,

achievement levels between schools than demographic variables, such as gender, ethnicity and SES (Goddard & Hoy, 2001).

The collective efficacy scale developed by Goddard and Hoy (2001) demonstrated itself to be an evolutionary step in the self-efficacy research domain. The scale incorporated previous efficacy research, demonstrated both convergent and divergent validity, and offered the ability to distinguish between schools of high and low levels of belief in teaching colleagues. The Collective Teacher Efficacy Scale as developed by Goddard and Hoy (2001) through past research defined itself as a powerful measurement device for assessing *collective* school efficacy (refer to Appendix G).

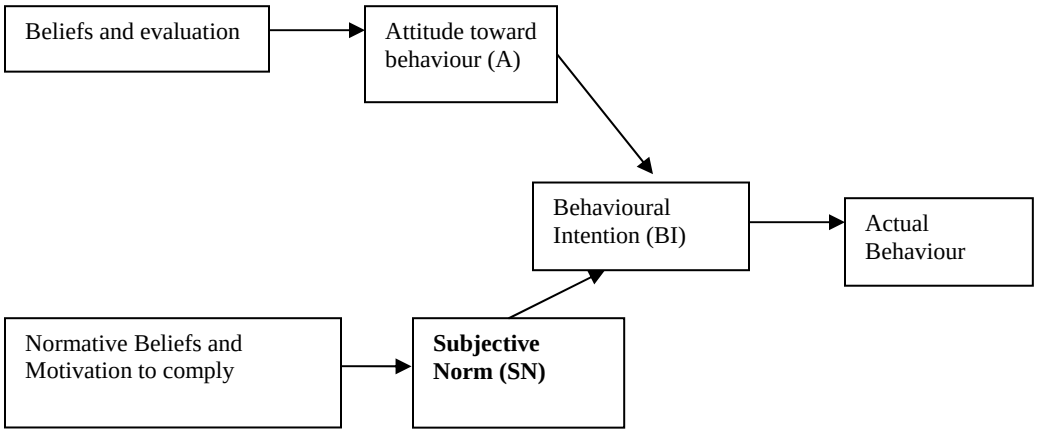
Goddard and Hoy's (2001) Collective Teachers Efficacy Scale presents a unique opportunity to assess collective school efficacy in a school system. However, an investigation into the relationship of this construct to computer acceptance in schools must also focus on appropriate measurement devices for assessing computer acceptance. The following section will present research on the development of Venkatesh and Davis's (2000) TAM2 an instrument described by its creators as "robust, powerful, and parsimonious for predicting [computer] user acceptance" (p. 187).

Technology Acceptance Model 2

Davis' (1986) technological acceptance model (TAM) evolved from Ajzen and Fisbein's (1970/2000) Theory of Reasoned Action, with the purpose of explaining and predicting degree of acceptance of computer technology. The Theory of Reasoned Action (TRA) proposes that intentions to perform a behavior is a function of two basic determinants, (a) individual attitudes toward the behavior and (b) social norms or the

"belief that specific individuals or a specific group would approve or disprove of the behavior" (Roberts & Henderson, 2000, p. 428, refer to Figure 4).

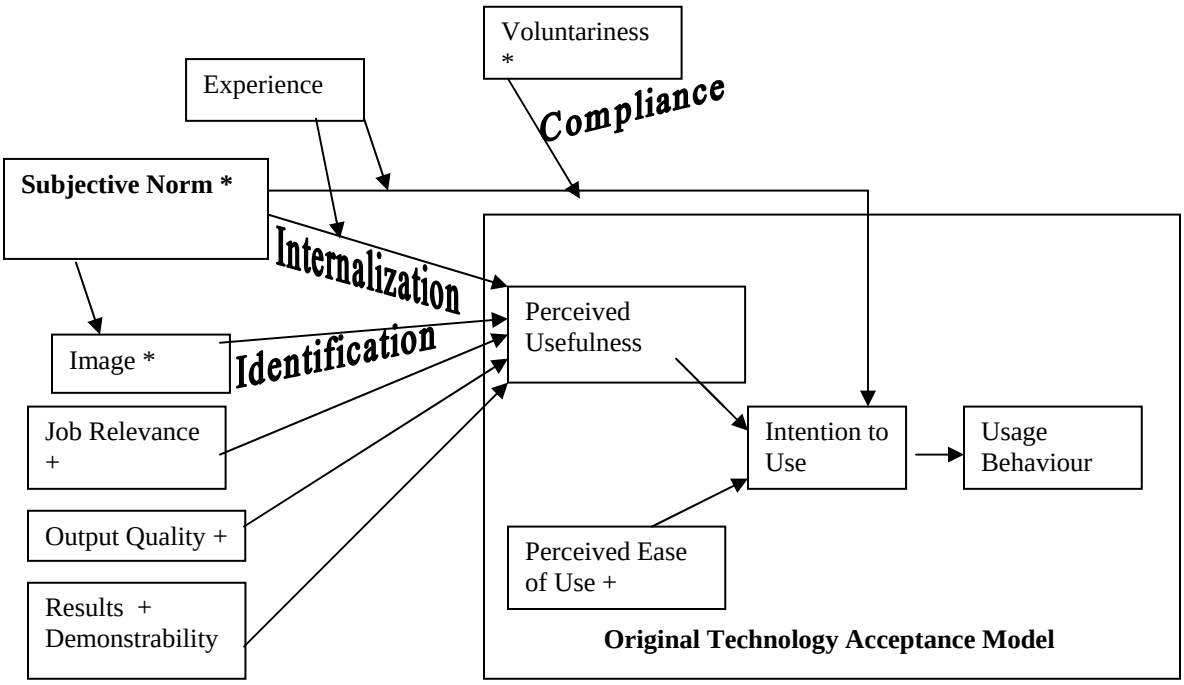
Figure 4 – Ajzen and Fishbein's (1970/2000) TRA



Attitudes towards the behavior were determined by beliefs about the consequences of the behavior. This determinant relationship, of attitude influencing performance of a behavior coincided with the original conceptualization of the TAM which was to "provide an explanation of the determinants of computer acceptance that is general [and] capable of explaining user behavior across a broad range of end-user computing technologies and user populations" (Davis, Bagozzi, & Warshaw, 1989, p. 985). To this end TAM built upon TRA's concept of an individual's attitude toward a behavior. Davis (1989) proposed that behavioral intentions to use a mainframe e-mail system; "Profs" and a data editing system; "XEDIT," were the result of two beliefs, 'perceived usefulness' and 'perceived ease of use' of the differing systems (p. 326). He defined perceived usefulness (PU), as "the extent to which a person believes that using the system will enhance his or her job performance," (Venkatesh & Davis, 2000, p. 187). Davis (1989) suggested PU was comprised of the three domain categories of: "job effectiveness," "productivity and time saving" and "importance of the computer system to one's job" (p.325). He defined

perceived ease of use (PEOU) as "the extent to which a person believes that using a system will be free of effort" (Venkatesh & Davis, 2000, p. 187). Davis (1989) proposed that PEOU consisted of the three categories of "physical effort, mental effort and ease of learning" (p. 327). Combined, PU and PEOU were proposed to mediate external variables, such as development processes and training, and these two beliefs were proposed to determine intention to use and through this predicted actual use (refer to Figure 5 – Original Technology Acceptance Model).

Figure 5 - Technology Acceptance Model 2 (TAM2 - Venkatesh and Davis, 2000)



* denotes social influence processes + denotes cognitive instrumental processes

To understand the influence of social influence processes on acceptance and usage of computer technologies, Venkatesh and Davis (2000) revised the original TAM model and incorporated three social influence processes. They took the subjective norm component from the TRA and broadened its' definition to include the effect of two additional social influence process, "internalization," defined through their "voluntariness" construct and

"identification" defined through their "image" construct in their TAM2 model (p. 189, refer to Figure 5).

The first social influence process Venkatesh and Davis (2000) incorporated into the TAM2 was subjective norm. Ajzen and Fishbein (1970/2000) defined subjective norm as a "generalized normative belief" which they proposed was a "person's perception that most people who are important to him [or her] think he [or she] should or should not perform the behavior in question," (p. 302). Venkatesh and Davis (2000) integrated this into their model and labeled it as the "compliance" effect of subjective norm which they proposed could be moderated by the "voluntariness," potential computer users saw in using the computer system (p. 188). They defined the compliance effect of subjective norm as an individual perception that another person wants him or her to "perform a specific behavior, and the social actor has the ability to reward or punish nonbehavior" (p. 188). Venkatesh and his colleague (2000) proposed this compliance effect would be moderated by the voluntariness with which an individual viewed usage of a computer system. Voluntariness they defined as "the extent to which potential adopters perceive the adoption decision to be non-mandatory" (p. 188).

In addition to the compliance effect of subjective norm's influence on intention to use a computer system, Venkatesh and his colleague (2000) proposed two additional social influence processes operated in conjunction with subjective norm, (a) internalization and (b) identification, both which influenced an individual's perceptions of the perceived usefulness of a computer system. The internalization effect they defined as an "informational social influence" which they suggested could be exemplified as a superior or co-worker suggesting that a particular computer system might be useful, the

individual forming a belief that the system may be useful and forming an intention to use the computer system (p. 189). While the identification effect Venkatesh and his colleague (2000) defined as image or the "degree to which use of an innovation is perceived to enhance one's status in one's social system," (p. 189). Venkatesh and Davis (2000) proposed image is mediated by the subjective norm of an individual's social system which in turn mediates the perceived usefulness of a computer system.

Venkatesh and his colleague (2000) additionally proposed four cognitive instrumental constructs: (a) job relevance, (b) output quality, (c) result demonstrability and (d) perceived ease of use, were determinants of perceived usefulness of a computer system. Job relevance they defined as "the degree to which the target system is applicable to his or her job," (p. 191) while output quality was defined as "how well the [target] system does what it does" (p. 192). The results demonstrability construct, Venkatesh and Davis (2000) defined as the "tangibility of the results of using" the system (p. 192). They retained the construct *perceived ease of use* from the original TAM model and utilized its' original definition of "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320).

Utilizing the TAM2 in four longitudinal field studies, Venkatesh and Davis (2000) found that social influence processes and cognitive instrumental processes both play significant roles in influencing computer user acceptance. Venkatesh and his colleague (2000) analyzed responses from 156 participants who used four different computer operating systems, two requiring voluntary and two requiring mandatory usage. They found that two social influence processes; subjective norm and image, significantly influenced perceived usefulness through both the internalization and identification paths

of the model in both usage settings. Their results also indicated that the compliance path of the model moderated subjective norms influence on intentions to use a computer system in a mandatory but not a voluntary computer use environment. They also found the cognitive instrumental processes played significant roles in influencing perceived usefulness of a computer system. Venkatesh and his colleague (2000) found job relevance, output quality, result demonstrability and perceived ease of use all influenced perceived usefulness significantly across all four studies. Additionally, though not hypothesized, they found that job relevance and output quality combined to influence an individual's perceptions about the perceived usefulness of a computer system. That is, participants combined perceptions of job goals; output quality, with consequences of system use; job relevance, in determining the usefulness of a computer system.

The effect of *experience* on perceptions of a computer system was also discovered by Venkatesh and Davis (2000). They found that the effect of two social influence processes, compliance and internalization, on perceived usefulness and intention to use a mandatory system subsides over time as users become more familiar with a system, but that participants still judged a system based on the potential status benefits resulting from its use. That is, they found that with experience participants relied less on social information to judge a computer system, but that experience did not effect participants' perceptions of image of using a computer system. Venkatesh and Davis (2000) found that, unlike social influences, the cognitive instrumental processes of the TAM2 remained consistent in their influence of perceived usefulness of a computer system over time.

Taken together, the TAM2 represents a unique measurement device for accessing an individual's perceptions of the use and usability of a computer system that recognizes

the influence of others, individuals and groups, on the individual (refer to Appendix C). Therefore, two differing schools, one displaying a collective efficacy pattern of high and one displaying a lower collective efficacy pattern, the social processes of the differing social systems should influence individual teachers perceptions of the usefulness of a computer system.

In summary, the Collective Efficacy Scale (Goddard & Hoy, 2001) provides a way to measure collective efficacy of teachers within a school and Venkatesh and Davis (2000) Technology Acceptance Model 2 affords a way to measure acceptance of computer technology. Combining these two measurement devices with the fact of less than expected use of computer technology by Saskatchewan students and their identification of teachers as the greatest source of knowledge about computer technology led to the question guiding this research, the influence of schools on teachers' acceptance of computer technology.

Summary

This chapter has presented the theoretical evolution of constructs of collective efficacy and technology acceptance pertinent to the research question under investigation in this study. The evolution of Bandura's (1986) self-efficacy construct has been traced to the collective efficacy construct and the theoretical development of Davis (1986) technology acceptance model and its translation into the TAM2 have been reviewed in this chapter. The following chapter will describe the methodology utilized in this research study: the research design, the instruments utilized, the sampling criteria, and data collection procedures will be presented.

CHAPTER 3

Methods

The purpose of this study was to investigate the factors influencing teachers' general and professional use and acceptance of computer technology. This chapter will discuss the research design, the applicability of survey instruments, the school sampling criteria, the data scoring and ethical considerations used to address the research question drawn from the purpose of this investigation.

Definition of the primary question was composed of four categories of investigation: High School teachers' computer skills and knowledge, High School teachers' use of computer technology, sources influencing teachers' perceptions of computer technology and the influence of collective efficacy on teachers' acceptance of the World Wide Web / Internet. These four categories broke down to the following subquestions:

(1) Do high school teachers have the computer skills and knowledge to use computers in the classroom?

(2) How are high school teachers using computer technology?

(3) What are the sources of high school teachers' computer knowledge and skills?

(4) Do high school teachers influence their colleagues' computer knowledge and skills?

(5) Do teaching colleagues, defined as a high school's collective efficacy, influence teachers' perceptions of computers, specifically the World Wide Web / Internet in the classroom? This question translated into

a. Do schools differing in levels of collective efficacy differ in technology acceptance levels?

Research Design

This study utilized a quasi-experimental research design to determine the extent to which a relationship existed between the predictor variable, (collective efficacy), and the criterion variable, (computer acceptance). This design was chosen due to collective efficacy being a naturally occurring variable with its different levels not open to manipulation on the part of the researcher. That is, membership in a school with either high or low collective efficacy is not something the researcher can randomly assign to participants. Schools differing in levels of collective efficacy were products of each school's unique collective atmosphere and the individuals within those schools. After establishing the design, a survey was developed to collect the data. The survey form was comprised of three instruments; a Collective Teacher Efficacy Scale, the Technology Acceptance Model 2 scale and a demographics instrument. The Collective Teacher Efficacy Scale and the Technology Acceptance Model 2 scale used in this research are presented in the following sections.

Instrument introduction

Three survey instruments were used to collect data (a) the Collective Teacher Efficacy Scale, (b) the Technology Acceptance Model 2, and (c) a demographic instrument. After establishing the applicability of these instruments permission to use these instruments was obtained from the instrument's developers. The Collective Teacher Efficacy Scale was used in this study due to its ability to differentiate between collective efficacy levels of differing teaching populations and the TAM2 was used because of its

demonstrated ability to distinguish between differing dimensions of technology acceptance.

The collective efficacy scale offered an instrument capable of differentiating the group natures of differing academic enclaves. It combines measurement of perceptions of teaching competence, defined through teaching skills, teaching methods, training and expertise, with measurement of perceptions of teaching tasks difficulty, defined in terms of barriers teachers confront and resources they can utilize. Past research, such as Goddard and Hoy (2001), suggests this scale is an instrument capable of accurately depicting teachers' perceptions of their school's ability to teach their students. The Technology Acceptance Model 2 was developed to measure an individual's acceptance and actual use of a computer system in the workplace. It integrates nine subscales, representing three constructs to measure individual technology acceptance: usage intentions, social influence processes, and cognitive instrumental processes. Past research (Davis, 1986; Chan, 2001) has demonstrated that this instrument is a valid and reliable measurement device for a variety of computer systems and participant populations. The following section will describe in more detail the Collective Teacher Efficacy scale and the Technology Acceptance Model 2 used in this study.

The Collective Efficacy Scale

The Collective Efficacy Scale developed by Goddard and Hoy (2001) consists of 21 items that measure the two integrated dimensions of collective efficacy, teaching competence and task analysis (Appendix G)**.** Participants are asked to rate their agreement with 21 items. Individual items on this instrument are assessed by participants on a 6 point scale ranging from 1- strongly agree to 6 –strongly disagree and participants

indicate their level of agreement by choosing a single level and filling in it's corresponding circle.

The Collective Teacher Efficacy Scale is based on a single theoretical construct with a multidimensional nature, that has empirical support of its' abilities to distinguish between groups with differing levels of efficacy. Collective efficacy is a construct that combines a teacher's perceptions of the competence of their school's teaching staff, with respect to (a) teaching skills, (b) methods, (c) training and expertise, with teacher's perceptions of barriers they confront and resources they can utilize in their job, into a single measurable construct. Goddard and Hoy (2001) utilized factor analysis to reveal support for the multidimensional nature of this one construct. The majority of questionnaire items loaded on two factors, task analysis and group competence .40 or higher, supporting the proposition that collective efficacy is a construct with two dimensions. A subsequent correlation coefficient of .71, ($p < .001$) showed there is a strong relationship between task analysis and group competence. An additional analysis found all the items loaded on one factor but were separated enough to represent two differing dimensions. 51% of the variance of all the items could be explained by one factor, 17 items loaded between .71 and .87 on a lone factor while the additional four items loaded between .47 and .70 on this same factor. Offering further support for that collective efficacy is one construct made up of two separate but related dimensions (Goddard and Hoy, 2001).

In a test of construct validity a positive moderate correlation, ($r=.54$, $p<.01$), was uncovered for the collective efficacy scale with tests of personal teaching efficacy (Hoy & Woolfolk, 1993). This moderate correlation demonstrates evidence of both the

convergent and the divergent validity of this measure. The convergent validity of the collective efficacy construct was demonstrated through the moderate relationship to another efficacy construct; personal teaching efficacy, and divergent validity of the CE construct was demonstrated through the moderateness of the relationship. The moderate strength of the relationship demonstrates the different referents of the constructs within the same theoretical basis; respectively, a self versus group orientation, resulting in a correlation, but a moderate correlation. The distinctiveness of the collective efficacy construct was further demonstrated through its' relationship with scales measuring constructs related but conceptually distinct from the collective efficacy construct. Further convergent validity evidence for the collective teacher efficacy scale, was demonstrated by a positive correlation with Tschannen-Moran, Woolfolk-Hoy and Hoy's Trust in Colleagues Scale (1998, $r=.67$, $p<.001$) and additional divergent validity evidence was demonstrated through a negative correlation with Zielinski and Hoy's (1983) Sense of Powerlessness Scale. Groups higher in collective efficacy were found to be similar to groups with a greater sense of trust in their colleagues while differing with groups that have a greater sense of group powerlessness, demonstrating the distinctiveness of the collective efficacy construct.

The Technology Acceptance Model 2

The second instrument used in this study was The Technology Acceptance Model 2 (TAM2) developed by Venkatesh and Davis (2000). This instrument consists of the three dimensions of technology acceptance; usage intentions, social influence processes and cognitive instrumental processes, which are operationalized through nine different subscales. Participants were asked to indicate their level of agreement with 27 statements**,**

each with a 7 point Likert scale ranging from 1 (strongly agree) to 7 (strongly disagree) (Appendix H).

Venkatesh and Davis (2000) collected both reliability and construct validity evidence for the TAM2 through a longitudinal study. Their study consisted of three different measurement times with four different organizations, allowing for test-retest reliability and construct validity evidence to be established. The nine differing subscales of the TAM2, measured monthly, demonstrated high test-retest reliability, that is a Cronbach's alpha coefficients of .80 or higher. Previous research, such as Davis (1989), demonstrated divergent construct validity for these subscales through factor analysis which revealed cross-loadings of .30 or lower. This low correlation between the various subscales indicated that subscales proposed to be measuring differing dimensions were not measuring similar concepts.

Demographic Instrument

The third instrument used in this research was a demographics instrument adapted from the background information section of Knezek and Christensen (1998) Teachers Attitudes Towards Computers Questionnaire. Questions were adapted to reflect a broader range of choices, for example in a question concerning types of computer training experiences participants had, the question was adapted to offer participants the option of selecting a combination of having training in basic computer literacy, word processing and integrating into classroom curriculum instead of only one answer option (Appendix I) . Demographic information requested from each participant included: years teaching, predominant teaching area, computer experience, frequency of computer use for personal and instructional use, frequency of computer use, computer training, type of computer

training, general subject area taught, grade level taught, different software applications used, age, and gender (refer to Appendix I).

Instrument Package Construction

The two instruments: the Collective Teacher Efficacy Scale and the Technology Acceptance Model 2 instrument, and the demographic form were compiled into one research package utilizing Remark Office OMR 5.5 software. This software was used to create the forms of the research package so that the data could be scanned into a spreadsheet.

Sample Selection

The sample for this study was selected from five high schools in one urban center of Western Canada. The rationale for choosing only one urban center was to control for differences that might arise in collective efficacy due to teaching context such as a rural versus urban setting and also to control for use differences due to Internet connections such as a broadband versus a dial-up connection. [4] This type of sample selection controlled for the greater access speed and 'always-on' connection characteristic of a broadband Internet connection found predominantly in urban settings which past researchers have found influences patterns of internet use (Veenhof, Neogi, & van Tol, 2003). The high schools in the same school district in one urban center helped to control for differing levels of support, such as computer support services, that may be present in a cross school district research design. The sample was limited to high schools to control for potential differences in organizational structure of Elementary, Junior-High, and High School, and differences in curriculum at the various levels.

[4] Broadband computer connections and information technology support were confirmed with school IT personnel through personal communication with the researcher prior to this study's commencement.

Data Collection Procedures

After receiving permission to conduct research from the ethics boards, principals from ten high schools were contacted by telephone. The first contact was intended to arrange a mutually agreeable meeting time or to describe the study to them and allow them to review the information packages intended for teachers (refer to Appendix E for an Agenda for meeting with High School Principals). After having the study described to them over the telephone, five principals declined to have their schools participate and five were e-mailed information packages to review. Following an opportunity to review the information, principals were asked to allow their teaching staff to participate in the study. Principals who agreed to their staff participating were asked to distribute research package envelopes containing a letter of introduction, the two survey instruments and the demographics form to their teaching staff (refer to Appendicies H, I and J, and K respectively). The letter of introduction to teachers outlined the purpose of the research study and invited teachers to participate. A paper survey was utilized to capture the greatest diversity of participants' perceptions of computer technology due to alternate data collection procedures, such as an online survey, potentially capturing only perceptions of those favorable to computer technology. Principals were also asked to allow the researcher to establish a 'drop-off box' for collection of completed and sealed research packages in the schools' main office. To protect the confidentiality of schools which participated in this research, each school was assigned an identification label; School A, B, C, D and E, and these labels served as references to individual schools for the remainder of this study. From these schools, 220 teachers were invited to participate

and 69 (31%) teachers responded. One teacher's responses were eliminated due to the majority of responses being illegible.

Data Analyses Procedures

The data was scanned using Remark 5.5. This software identified missing or erroneously marked responses, such as two responses for one question, which were inspected and confirmed by the researcher. After inspection, the data was exported to a Statistical Package for the Social Sciences 13 (SPSS13) spreadsheet for data scoring and coding. The following sections will describe the data conversions and coding procedures used.

Data Scoring

The data conversions for this study consisted of reverse scoring specific items and replacing missing data. To establish a total score for both the Collective Efficacy Scale and the TAM2 reverse scoring was necessary for subsequent analysis. Additionally, after inspecting the data, missing scores were replaced with school's mean subscale scores for further analysis.

Consistent with Hoy (2002) ten items from the Collective Efficacy instrument were reverse scored: items 6, 7, 8, 9, 10, 12, 14, 19, 20 and 21. For example, on a negatively worded question a previous score of 6, or strongly agree, was changed to a score of 1 to reflect the participant's perception of low collective efficacy for that particular question. Responses to all 21 questions were averaged across each school to produce one overall school collective efficacy score. These school collective efficacy scores were used to categorize each school into either a low, median or high collective efficacy group for analysis (Table 2).

Table 2 Collective Teacher Efficacy Scores and classification by school. (N = 68)

Subject	Mean	Category
School A	**4.84**	**High**
School B	**4.37**	**Median**
School C	**4.28**	**Low**
School D	**4.55**	**High**
School E	**4.03**	**Low**

For scoring the TAM2, item #26 was reverse scored, due to the negative wording of that question. Consistent with Venkatesh and Davis (2000), all individual item scores from each subscale were summed and averaged to obtain one composite subscale score that represent each individual's subscale score during subsequent analysis. Utilizing the individual subscale of perceived usefulness as an example, the four items from this subscale was summed to create a total subscale score for each individual. Summing these four items could result in a subscale score ranging from four (mostly strongly disagree), through 16 (exactly neutral), to 28 (mostly strongly agree). Once summed, a mean subscale score was derived and this became participants' subscale scores used in subsequent analysis. The descriptive statistics for the 9 subscales of the TAM2 appear in Table 3.

Table 3 Technology Acceptance Model 2 Descriptive Statistics. (N = 68)

Subscale	**Mean**	**SD**	**Variance**	**Range**
Intention to Use	6.44	.85	.73	4.00
Perceived Usefulness	5.56	1.32	1.74	6.00
Perceived Ease of Use	5.14	1.02	1.03	5.00
Subjective Norm	4.07	1.32	1.75	6.00
Voluntariness	5.53	1.33	1.76	6.00
Image	2.80	1.55	2.41	5.33
Job Relevance	5.36	1.13	1.28	4.50
Output Quality	4.79	1.04	1.09	4.50
Results Demonstrability	5.49	.85	.72	3.00

Data Examination

The data were also examined using a Pearson Product Moment Correlation analysis to determine the strength of the linear relationships between the criterion variables. That is, that the criterion variables were measuring related dimensions of the same construct but not dimensions that were overlapping to the degree they were measuring the same dimension.

Utilizing Pearson Product Moment Correlations the strength of the relationships among the predictor variables were computed.

Table 4 Bivariate criterion variable regression. (N = 68)

	ITU	PU	PEOU	SN	V	IM	JR	OUTQ	RD
ITU	1	.60**	.43**	.28*	.04	.13	.48**	.18	.21
PU		1	.34**	.47**	.01	.23	.65**	.44**	.29
PEOU			1	.17	.06	.16	.28*	.17	.43**
SN				1	-.15	.46**	.48**	.23	.10
V					1	-.20	-.09	.13	-.19
IM						1	.16	-.07	.15
JR							1	.30*	.40**
OUTQ								1	.22
RD									1

**Correlation is significant at the .01 level
* Correlation is significant at the .05 level

The results indicated: (a) weak relationships - between .0 and .25, (b) low relationships - between .26 and .49, and (c) moderate relationships - between .05 and .69, but nothing to suggest the differing subscales were measuring the exact same construct. These

relationships demonstrate the divergent and convergent validity of the various subscales of the TAM2. Subsequently all these subscales were used in further analysis.

School Classifications

To allow analysis of schools based on their levels of collective efficacy, categorical or dummy variables were established to distinguish the schools. The schools were divided into three categorical groups based on their mean school level of collective efficacy, that is a low collective efficacy group, a median collective efficacy group and a high collective efficacy group were established. Schools A and D formed the high collective efficacy group (n = 29, 46% of the sample), schools C and E formed the low collective efficacy group (n = 22, 33% of the sample) and school B, the median collective efficacy group (n = 17, 20% of the sample) which served as the constant in subsequent regression analysis. The school with the median score was chosen as the reference group for reasons; (a) the median school represented the middle of the distribution of school collective efficacy scores and was less affected by extreme values and (b) the median score was a better representation of the central tendency of the schools due to their being an odd number of schools in the sample. Thus school B was chosen as the control group or the reference group. New variables reflecting the group categorization were established to allow for comparison amoung the three groups. The reference group (B) was coded as 0, and the other schools were coded with either 0's or 1's to indicate group membership. Coding in this manner allowed all three groups to compared simultaneously using with the median scoring school as the constant in the regression analysis. Group memberships were entered as predictor variables and TAM2 subscales were entered individually as dependent variables. This helped to determine if the schools differing in

mean collective efficacy scores also differed in mean computer acceptance scores integrated into the TAM2.

Instrument Examination

Before utilizing the collected data to address the research questions under investigation the data from the two instruments, the Collective Efficacy Scale and the Technology Acceptance Model 2, were examined to ascertain the degree of internal consistency between scale items using Cronbach's Alpha.

The Cronbach's Alpha for the collective efficacy scale was .81. Predictor variables were subscale scores from the TAM2: intention to use (alpha = .95), perceived usefulness (alpha = .93), perceived ease of use (alpha = .80), subjective norm (alpha = .78), voluntariness (alpha = .80), image (alpha = .91), job relevance (alpha = .86), output quality (alpha = .67) and result demonstrability (alpha = .73). All variables exceeded the criterion score of .65 adopted for this study, which indicating that all the subscales could be used in subsequent analysis. Even though the usual criteria for a cutoff score for Cronbachs Alpha is .70 a more lenient cutoff of .60 has been adopted for other research (Garson, 2006). This is because the formula for calculating Cronbach's Alpha takes into account the number of items in the scale, the more items in a scale then the greater the potential for higher alpha values (Garson, 2006). Various subscales utilized in this study contained only two items, such as the output quality subscale, creating the potential for a lower alpha level before analysis of these subscales began. Due to this potential a more lenient alpha of .65 was adopted for this research.

Ethics approval

An ethics application was submitted to the University Advisory Committee on Ethics in Human Experimentation Behavioural Sciences Committee prior to requesting ethical approval from the two prospective School boards (refer to Appendix A, B and C for the differing ethics applications). Ethics approval was obtained from the University Advisory Committee and the two participating School Boards prior to seeking participants (refer to Appendicies D, E and F respectively). The applications to the differing ethics boards were in accordance with the University ethics board's guidelines. Additional, specific information requested by the differing ethics boards was included in application to those individual agencies only, such as the question of how this study will contribute to improvement of education in the specific school system, was addressed in applications specifically to the school boards.

Summary

This chapter has described the methodology utilized in this study to address the research question under investigation. The research design, the operalization of demographic and theoretical constructs into survey instruments, the sampling selection, data collection and conversion procedures, and ethical considerations used in this research has been described in this chapter. The following chapter will outline the results of the investigation into the factors influencing teachers' general and professional use and acceptance of computer technology.

CHAPTER 4

Presentation of Results

This chapter reports the results of this study. Results of data analysis will be presented in this chapter while interpretation of these results will be present in the chapter following chapter. The first section of this chapter summarizes information gathered about participants' demographics, the next five sections present data gathered to address subquestions generated from the general research question of the factors influencing teachers' general and professional use and acceptance of computer technology.

Participants' Demographics

This section presents demographic information on the participants. The sample for this study consisted of teachers in five high schools, all located in one city in Western Canada. From a potential 220 participants 69 returned responses, one of these was discarded. Table 5 depicts participants' demographic data.

Table 5 Demographics.

School	**N**	**M**	**F**	**Teachers' Ages**				**Grades Taught**					**SES**[5]
				<34	35-44	45-49	>50	9	10	11	12	Multiple	
A	16	6	7	4	2	2	7	1	1	1	0	12	83
B	17	4	11	3	4	5	5	0	1	0	0	16	67
C	15	5	7	3	8	2	1	2	1	3	1	6	76
D	14	5	8	3	4	2	3	0	0	0	0	12	76
E	6	5	2	2	3	1	1	0	2	0	1	4	76
Total	68	25	35	15	21	12	17	3	5	4	2	50	

Note. SES formula calculated using formula based on U. S. Bureau of Census S. E. S. formula (1963).

[5] SES formula - S E S Score = Income + Education + Occupation / 3, Income, Education and Occupation scores obtained from City of Saskatoon website http://www.city.saskatoon.sk.ca/org/city_planning/index.asp

Participants represented an almost equal age representation with 52% being under 44 years of age and 42% identified themselves as 45 years of age and older. 4 participants (6%) did not respond to this question. Participants also identified themselves as teaching multiple grades (72%), with only 14 (21%) specialized in single grade instruction. Five participants failed to report their current teaching assignment. United States Census bureau neighborhood socioeconomic status (SES) categories were used to categorize all the schools and all were found to belong to the middle SES category, even though School A's neighborhood represents the high middle range of neighborhood socioeconomic status, as shown in Table 5.

Participants' teaching specializations

A breakdown of the subject areas taught is shown in Table 6. Participant's predominant area of teaching was English, 25%, with Art Education teachers making up 3%, the smallest percentage of the sample.

Table 6 Subject Area Taught (N = 68)

Subject	**N**	**%**
Arts Education	2	2.9
Language	4	5.8
Physical Education	5	7.2
Mathematics	6	8.7
Sciences	6	8.7
Social Sciences	8	11.6
Practical and Applied Arts	8	11.6
Other	11	15.9
English	17	24.6
Missing	**1**	

The *Other* subject area taught by participants included: Business Education, Christian Ethics, Online Teacher, Special Education, and the subject combinations of

Career and Work Education, Physical Education and Science, resource room, English and Native Studies and Administration.

This section has presented demographic information of the sample surveyed to address the research question of investigate the influence of academic culture, defined as collective school efficacy, on teachers' acceptance of computer technology. Definition of this primary question breaks down into the subquestions:

(1) Do high school teachers have necessary computer skills and knowledge to use computers in the classroom?

(2) How are high school teachers using computer technology?

(3) What are the sources of high school teachers' computer knowledge and skills?

(4) Do high school teachers, in general, influence their colleagues' computer use?

(5) Do teaching colleagues, defined as a high school's collective efficacy, influence teachers perceptions of computers, specifically the World Wide Web / Internet? This translated to the question

    a. Do schools differing in levels of collective efficacy differ in technology acceptance levels, defined by the TAM2 subscales?

The following sections will address the research subquestions generated by this main question as to the computer knowledge and skills participants possess, the uses they put those skills to, the sources of their knowledge and generally whether other teachers play a role in influencing their colleagues computer perceptions and specifically whether the collective efficacy of schools influence teachers' perceptions of use of the World Wide Web / Internet.

Participants' computer training levels and experience

This section includes information gathered to address the first subquestion of this study - do high school teachers have the computer skills and knowledge to use computers in the classroom? The responses to this question are reported in Table 7.

Table 7 Training Level and Computer Experience of Teachers (N = 68)

	Computer Applications													
	No Training		**Basic Training**		**Word Processing**		**Class Integration**		**Basic and Word**		**Word and Class Integration**		**Basic, Word and Class Integration**	
Training	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	13	19.1	6	8.9	7	10.3	2	2.9	1	1.5	13	19.1	26	38.2
	Word & Spreadsheets		**Classroom Use**		**Admin.**		**Word, spreadsheets &Classroom**		**Word, spreadsheets & Admin**		**Classroom & Admin.**		**Word, spreadsheets, classroom & Admin.**	
Experience	N	%	N	%	N	%	N	%	N	%	N	%	N	%
	2	2.9	1	1.5	2	2.9	12	17.6	9	13.2	3	4.4	39	57.4

The majority of respondents 55 (81%), as shown in Table 7, stated they had basic computer literacy skills and of those 41 (75%) had additional training in Word applications and in integrating computers into the classroom curriculum. The results also indicate that while the majority of teachers, 41 (60%), had training in integrating computer applications into the classroom a greater percentage of teachers, 55 (81%), had actual experience integrating computers into the classroom. These results indicate that the majority of these teachers did have the skills, knowledge and experience to integrate computers in the classroom. The next section addresses the question of teachers' computer use.

Participants' computer uses

Data regarding personal, general and instructional computer use by participants was collected to address the research subquestion - how are high school teachers using computer technology? Table 8 shows that the majority of teachers (90%) used computers daily for personal uses, while only 31% of participants used computers daily for instructional uses. These results suggest that teachers percieve computers more as instruments for personal use than for instructional purposes.

Table 8 Frequency and Duration of Teachers' Computer Uses (N = 68)

	Computer Use									
	Daily		**Weekly**		**Occasionally**		**Not At All**			
Frequency	N	%	N	%	N	%	N	%		
Personal	61	89.7	3	4.4	4	5.9				
Instructional	21	30.9	15	22.1	27	39.7	5	7.4		
	> 25 Hrs.		**16-25 Hrs.**		**6-15 Hrs.**		**2-5 Hrs.**		**< 1 Hr.**	
Duration	N	%	N	%	N	%	N	%	N	%
General	6	9	8	11.9	20	29.9	32	47.8	1	1.5
Instructional			5	8	9	14.5	22	35.5	26	41.9

Table 7 shows that 80% of teachers use computers 15 hours or less per week for general purposes and that 78% of teachers use computers for instructional purposes less than 5 hours per week. This suggests that the majority of teachers perceive computers as more useful in a general sense than as instruments for classroom instruction. The following section will address the two subquestions as to the sources of participants' computer knowledge and skills and the general influence of colleagues on teachers' perceptions of computers.

Sources of participants' computer knowledge and skills

This section will address the research subquestions of the sources of high school teachers' computer knowledge and skills and determine if colleagues play a role in influencing teachers' perceptions of computers. This section will address the subquestions of - What are the sources of high school teachers' computer knowledge and skills, and do high school teachers influence their colleagues' computer knowledge and skills? Data gathered to address these questions are presented in Table 9.

Table 9 Teachers Ratings of Sources of Computer Training (N=68)

	Sources of Teachers' Computer Knowledge and Skills							
	Self -Taught		**School District**		**University**		**Others**	
Teachers' Ratings	N	%	N	%	N	%	N	%
Greatest	36	52.9	4	5.9	6	8.8	7	10.3
Great	14	20.6	11	16.2	9	13.2	11	16.2
Lesser	5	7.4	22	32.4	12	17.6	6	8.8
Least	5	7.4	12	17.6	17	25	7	10.3
Total	60	88.2	49	72	44	67	31	45.6
Missing	8	11.8	19	27.9	24	35.3	37	54.4

Teachers' identified the *self-taught* category as the largest source of computer knowledge and skills, 73% of teachers rated self-taught as either a great or the greatest source of computer skills and knowledge. In comparison, 27 % of participants suggested that *others* play a substantial role in their gaining of computer skills and knowledge, rating other as their second largest source of computer knowledge and skills. Formal training through school districts and Universities were rated as the lowest source of computer knowledge and skills. Almost half (43%) of the participants' identified

University training as either a lesser or the least source of their computer skills and knowledge while 50% similarly identified school district training as a lesser source of their computer knowledge and skills. In general, participants' identified non-formal sources, self taught or others, as their greatest sources of computer knowledge and skills.

To determine if colleagues played a role in influencing teachers' perceptions of computer technology participants were asked to specify who the category "Other' applied to. Of the 21 participants who responded to this question, nine identified coworkers as an additional source of computer information. This group identified teaching colleagues most frequently (43%) as a source of influence in their perceptions of computer technology.

In general, participant's responses to these questions suggests that while teachers have the skills, knowledge and experience necessary to utilize computers in the classroom, they predominantly see computers more as instruments for general and personal use rather than as instruments to assist in classroom instruction. Additionally, teaching colleagues do seem to play a role in influencing teachers' perceptions of computers. The specific question of how great an influence teaching colleagues have on teachers' acceptance of a specific computer application such as the World Wide Web / Internet, an area of concern identified by Saskatchewan Education Indicators (2000), is addressed in the next section.

The influence of colleagues on teachers' perceptions of the World Wide Web / Internet in the classroom.

The final subquestion under investigation in this study was - do teaching colleagues, defined as a high school's collective efficacy, influence teachers' perceptions

of computers, specifically the World Wide Web / Internet in the classroom? High school teaching colleagues' influence for this subquestion was defined through collective efficacy. This was due to the collective efficacy scales ability to distinguish differing teaching populations' definitions of what it meant to be successful in their schools. The TAM2 was used to define perceptions of usefulness of the World Wide Web / Internet in the classroom due to the ability of this instrument to measure computer application adoption behaviours. To address this subquestion mean school grouping scores were compared with school scores on the individual TAM2 subscales. Table 10 show the results of regression analysis of the final research question of this study.

Table 10 Results of School Collective Efficacy Groupings: Low, Median and High, comparisons on the TAM2 subscales. (N = 68)

Computer Adoption Dimensions	***Subscale***	***F***	***P***
Social Cognitive Process	Voluntariness	$F(2,65) = .16$	.86
	Subjective Norm	$F(2,65) = 1.86$	.16
	Image	$F(2,65) = 3.41$	.04*
Cognitive Instrumental Processes	Job Relevance	$F(2,65) = .18$	.84
	Output Quality	$F(2,65) = .74$	.48
	Results Demonstrability	$F(2,65) = .91$	.41
	Perceived Ease of Use	$F(2,65) = 1.69$	.19
	Intention to Use	$F(2,65) = 2.30$	.11
	Perceived Usefulness	$F(2,65) = .03$	.97

* $p < 0.05$

High schools differing in levels of collective efficacy did not differ in perceptions of usefulness of the World Wide Web / Internet for professional use except for the one social cognitive process of image. There was no statistically significant relationship between schools with differing levels of collective efficacy and their teachers' perceptions of use of the World Wide Web / Internet use in the classroom in terms of

their intention to use, perceived usefulness, perceived ease of use, subjective norm, voluntariness, job relevance, output quality, or result demonstrability perceptions.

Further investigation of the relationship between collective efficacy and the image construct of the TAM2 [$F(2, 65) = 3.41$, $p < .05$] revealed that the low collective efficacy group was found to differ from the median collective efficacy group; t (65 = 2.525, $p <$ .05) and the high group was significantly different from the median group; t (65 = 2.039, $p <$.05). However the Bonferroni correction was adopted to maintain the .05 significance levels because multiple comparisons were conducted simultaneously through dummy coding the schools (Miles & Shelvin, 2001). The Bonferroni correction corrected for multiple comparisons conducted and decreases the chance of a type I error, that is falsely rejecting the null hypothesis. Utilizing the Bonferroni correction an alpha of .025 is adopted to maintain the .05 type I error rate. After applying the Bonferroni correction the difference between these low and median groups was still found to be statistically significant t (65 = 2.525, p = .014), but the relationship between the high and median schools t (65 = 2.039, p = .046) was found to be nonsignificant. Examination of the slope associated with the low and median group analysis (-1.22) suggests that the mean of the low collective efficacy school is lower than the mean of the median collective efficacy school. This suggests that teachers in schools with low collective efficacy have a differing perception of the image of the World Wide / Internet use in the classroom than teachers in schools with median levels of collective efficacy. Schools with median and high levels of collective efficacy did not suggest this difference, indicating that a similar relationship may exist between schools with high and low levels of collective efficacy.

Summary

The results of the five subquestions suggest that even though the majority of participants have the necessary knowledge and skills to use computers in the classroom they are using computers predominantly for personal and general uses. In addition, teachers appear to influence their colleagues' computer knowledge and skills and colleagues do influence teachers perceptions' of the image portrayed by using the World Wide Web / Internet in the classroom. The results of subquestion 1 indicated that the majority of participants had the knowledge and skills to integrate computer technology in the classroom and 81% had actual experience integrating computer technology. The results of subquestion 2 indicated that three times the number of participants were likely to use computers for personal than instructional use and a comparable percentage of teachers weekly would use computers three times as much for general purposes as for instructional uses. The results of subquestion 3 suggested that participants perceived as their greatest sources of computer knowledge to be either self-taught or from others; formal institutions were depicted as lesser sources of knowledge and skills. Subquestion 4 results suggested participants viewed teaching colleagues as a source of computer knowledge and skills. While the results of subquestion 5 suggested that the greatest effect a school's collective efficacy has on teachers' perceptions of computer technology was in the status a teacher may have gained from using the World Wide Web / Internet in the classroom. However due to the small sample size of this study, these results must be interpreted cautiously. Interpretation of these results is presented in the next chapter.

CHAPTER 5

Interpretation of Results and Conclusion

The purpose of this chapter is to discuss the research question, the results and research limitations of this research. In a previous study, 87% of students identified teachers as their greatest source of computer knowledge and the largest discrepancy discovered was students' use of the internet, a computer application associated with a higher level of computer literacy (SEI, 2000). This discrepancy, combined with previous research findings that 97% of the Province's secondary schools have broadband Internet connections, prompted the question as to what was influencing teachers' perceptions of using computers technology in general and specifically using the World Wide Web / Internet in the classroom. The data collected during this research study supported the propositions that teachers have the knowledge, skills and training necessary to integrate computers into the classroom curriculum, but that the majority was three times more likely to use computers for personal or general uses than for classroom instruction. Additionally the proposition that teaching colleagues may influence each others' perceptions of computer technology was also supported. Evidence supporting these propositions comes from an examination of the five subquestions examined during the course of this research. The five subquestion investigated were:

(1) Do high school teachers have the computer skills and knowledge to use computers in the classroom?

(2) How are high school teachers using computer technology?

(3) What are the sources of high school teachers' computer knowledge and skills?

(4) Do high school teachers influence their colleagues' computer use?

(5) Do teaching colleagues, defined as a high school's collective efficacy influence teachers' perceptions of computers, specifically the World Wide Web / Internet? Which translated into the question

   a. Do schools differing in levels of collective efficacy differ in technology acceptance levels, defined by the TAM2 subscales?

These subquestions will be discussed in the following sections along with limitations and recommendations for future research.

Subquestions 1, 2, 3 and 4 Results and Interpretation

The first two subquestions were – do high school teachers have the necessary skills to use computers in the classroom and how are high school teachers using computer technology? The data suggested teachers had general computer knowledge and experience and classroom computer integration training and experience. However, it is less clear if teachers are integrating computer use in the classroom and if so how such integration is being undertaken. The majority of participants (60%) stated they had training in integrating computers into the classroom and 81% stated they had experience in integrating computer technology in the classroom. However the majority of participants used computers weekly for general use (80%) and daily for personal use (90%) while less than 1/3 of participants reported using computers daily for instructional use. On a weekly basis, a comparable percentage of participants, 80% and 78%, spent three times as much time using computers for general uses, such as word processing, spreadsheet, and administrative functions, than for instructional purposes. These findings suggest that even with knowledge and training computers were being utilized less for instruction than for general purposes by teachers. Previous researchers, such as Relich

(1996), have demonstrated the effect teachers' belief in their own teaching abilities to teach math has had on their students': (a) self-concepts, (b) attitudes and (c) career choices. This has the effect of creating what Tobias (1993) termed as student math insiders and math outsiders. Teachers utilizing computers for general and personal uses and not for instructional uses might be creating a similar inclusion / exclusion computer culture among their students. This may have been reflected in the discrepancy between student technology literacy performance and Provincial expectations (SEI, 2000).

Data collected for the next two subquestions (What are the sources of high school teachers' computer knowledge and skills, and Do high school teachers influence their colleagues' computer use), suggests the importance of colleagues to the computer integration process. Half of the participants surveyed identified non-formal sources of computer knowledge and skills, such as other teachers, as the most effective sources of computer information. Over a quarter of these participants suggested that 'others' were an important source of knowledge and skills. From the 21 participants who identified who these specific 'other' were, 43% identified these others as teaching colleagues. This recognition of fellow teachers as a source of knowledge and skills emphasizes the influence teaching colleagues may play in regard to computer technology. The identification of teaching colleagues as a source of influence is supported by Ertl and Plante's (2004) research in which principals from schools across Canada identified mentoring strategies as the most effective strategy for teachers to learn about new information and communication technology.

The data collected for the previous research questions supports the propositions that teachers have computer knowledge and skills to integrate computer technology in

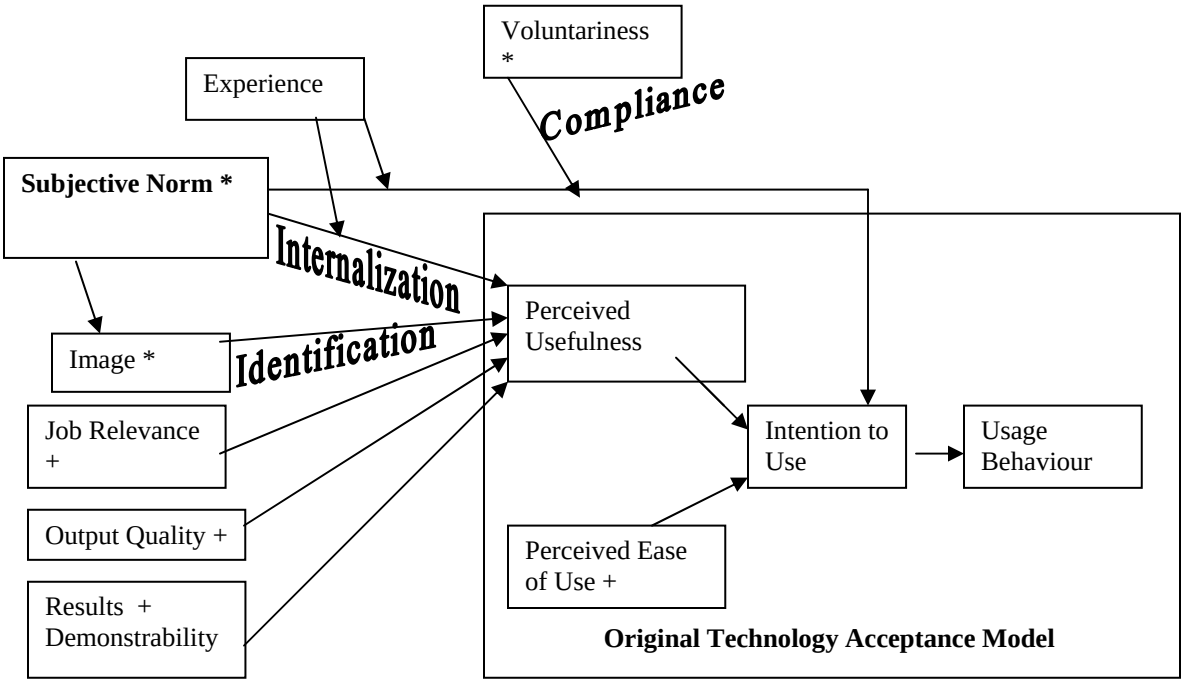
their classrooms, however it is less clear if they are and what type of influence teaching colleagues play in the integration process. The results indicated the majority of participants in this study perceived computers as tools for general or personal uses not as tools for classroom instruction. The next subquestion was designed to address the specific question as to the role the influence of teaching colleagues, defined as a school's collective efficacy, plays on teachers' acceptance of computer technology, defined as the World Wide Web / Internet in their jobs. The majority of findings from investigation into this research question were non significant.

Subquestion 5 Results and Interpretations

The results from analysis of the final subquestion will be presented in this section in terms of the theoretical and causal relationships groupings underlying both the TAM and the TAM2 models. Davis in his development of both theoretical models utilized an "attitude – intention – behaviour" progression to explain adoption of computer technology (Ozag & Duguma, 2004, p. 4). The results of this research will be presented in a similar order, utilizing definitions of the various constructs and previous research to demonstrate that the findings of the present research support previous research findings. The interpretation of the results of the analysis of whether schools differing in collective efficacy scores differ in acceptance of computer technology will be presented in the following order: (a) the Social Influence Processes subscales, the attitudinal step in the adoption progression, (b) the Cognitive Instrumental Processes subscales, the intention step, and (c) the Intention To Use and the Perceived Usefulness subscales, the behavioural step in the progression of adopting computer technology. The results of this final research question are presented in the following sections. Venkatesh and Davis'

(2000) TAM2 is presented again in Figure 6 to assist in interpretation of the results of this final research question.

Figure 6 - Technology Acceptance Model 2 ***(TAM2 - Venkatesh and Davis, 2000)***



* denotes social influence processes + denotes cognitive instrumental processes

Social Influence Processess Results and Interpretation.

Venkatesh and Davis' (2000) operationalized the Social Influence Processes dimension of their TAM2 model through the voluntariness, subjective norm and image subscales. The voluntariness and image constructs will be discussed first as these two represent internal influences related to changing an individual's belief structure and represent potentially moderating forces on the subjective norm construct, as depicted in Figure 6. The influence the subjective norm of a group may exert on the perceived usefulness of a computer system may be moderated by the image an individual perceives he or she will obtain through use or non-use of a particular computer system. The voluntariness construct may play a similar moderating effect on the influence a groups

subjective norm may have on an individual's intentions to use a particular computer system.

Voluntariness results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of voluntariness of use of the World Wide Web / Internet in the classroom. The definitions of voluntariness assist in interpreting this result. For example, Venkatesh and Davis (2000) defined voluntariness as the "compliance" effect moderating the direct effect of the subjective norm construct on intention to use computer technology (p. 188). They defined this as individual's perception that a significant other wants them to perform a specific behaviour and that significant other has the ability to reward or punish them for performing or not performing the behaviour. Benoit (2004) suggested that this construct included "motivation to comply" (p. 1). Venkatesh and Davis (2000) demonstrated that this construct will have an effect on the TAM2's subjective norm component influence on an individual's intentions to use computer technology in a mandatory but not voluntary usage setting. In summary, previous definitions of voluntariness suggest it represents a moderating effect on individual's motivation to comply with the social norm in a mandatory computer use setting in order to receive a reward.

The distinction between mandatory and voluntary use of a computer system as a moderating effect is indicated in the findings of the present research. The World Wide Web / Internet is not specified as a mandatory system to be used in classroom instruction, participants would view this application as voluntary and not differ in valuing its classroom use regardless of the level of collective efficacy present in their school.

Hartwick and Barki's (1994) research highlights another moderating aspect of the voluntariness that the present research supports. Based on their research they suggested that voluntariness has a greater effect in the early stages of adoption of computer technology. As time passes the social pressure to adopt a computer system decreases in the light of actual application of the system and experience. Participants in this study may have had enough exposure to the World Wide Web / Internet in their personal lives to negate the effect of social compliance in adopting it for use in classroom instruction.

Image results and interpretation

A statistically significant relationship was found between schools differing in levels of Collective Efficacy and their teachers' perceptions of the image of using the World Wide Web / Internet in the classroom. Venkatesh and Davis (2000) defined the image construct's influence as "identification," the basis of which is "referent power," or the potential status an individual has or may obtain within a group (p. 189). The significant difference between schools differing in levels of collective efficacy on the image subscale is consistent with previous research. Chan (2001) in a study of undergraduate and graduate students from seven Hong Kong Universities found that image was as significant factor in intentions to adopt Internet banking. He suggested that due to the personal nature of banking and the "trendy" nature of Internet banking participants would share their knowledge of Internet banking, but only with close friends to gain standing within the group of friends (p. 99). Suggesting that the identification component of the TAM2; the image component, would be found among groups with more cohesiveness, such as a group demonstrating a higher levels of collective efficacy. Additionally the present research supports Venkatesh and Davis' (2000) theoretical

proposition that while the other social influences of the TAM2 model; subjective norm and voluntariness, may weaken with experience the influence of image will remain strong as long as use of the system is valued. That is, the image construct may have been less susceptible to the influence of experience of using the World Wide Web / Internet than the other social influence processes of the TAM2 due to participants valuing its' use in light of experience with it.

Subjective Norm results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of subjective norm of use of the World Wide Web / Internet. The subjective norm construct of the TAM2 traces its definition back to Fishbein and Ajzen's (1975) component of normative beliefs; "the person's belief that reference group or individual thinks he should or should not perform the behaviour" (p. 301). However a caveat Fishbein and his colleague (1975) placed on this construct's definition was that the reference group would vary dependent on the behavioural situation. Fishbein and Ajzen (1975) stated that "in some instances the expectations of a person's family or friends may be most relevant, but in others it may be the expectations of his [or her] supervisors or the society at large which are most influential" (p. 302). These definitions, in light of the present research, suggest that in school settings the diversity of influence should be investigated in a broader fashion and the influence of other groups, such as supervisors or supervisory staff, should be investigated. Fishbein and Ajzen (1975) further suggested that in the presence of more than one reference group, motivation to comply with each of the relevant groups should be measured, separately, to ascertain the group with the greatest influence. This was not done in the present research but future research on this

subject should investigate the influence of a broader range of participants in a school's enclave, greater than soley its' teachers.

The influence of school leadership may in the present research be playing a role that is eclipsing the influence of teaching colleagues in the acceptance of computer technology. A role leadership may be playing in the present research is as an obstacle. O'Conner, Goldberg, Russell, Bebell and O'Dwyer (2004) found teachers from 22 Massachusetts school districts identified lack of technology leadership as an obstacle to technology integration. The influence of a lack of technology leadership may be eclipsing the influence of teaching colleagues and this may be what is depicted in subjective norm research results. Future research should address this alternate, possibly greater, source of influence.

Summary of Social Influence Processes constructs

The results of the social influence process constructs: voluntariness, subjective norm and image are consistent with previous research. The research results found with the voluntariness construct is consistent with previous research that indicated the strength of this construct is greater in the early stages of adoption of a mandatory computer system. Due to the possible familiarity of teachers with the World Wide Web / Internet in their personal lives and the voluntary nature of its use in the classroom the present research results offer support for previous research findings. The results of analysis of the construct of subjective norm are consistent with previous researches propositions that influence of leadership may be eclipsing the influence of teaching colleagues and this proposition warrants further investigation. The statistically significant difference between schools with higher and lower levels of collective efficacy and the image, or the

identification, construct is consistent with previous research as well. Sharing information that is 'trendy,' or that could raise ones status within a close grouping, is consistent with teachers sharing World Wide Web / Internet information with teaching colleagues in a school higher in collective efficacy than a school where teachers do not believe in the teaching ability of their colleagues.

Cognitive Instrumental Processes

This section will discuss the results of the cognitive instrumental processes, the determinants of the perceived usefulness construct and their relationship with collective efficacy as discovered in this research. These constructs represent the components of an individual's cognitive judgements, or mental representations, about the applicability of a computer system to the job they are doing. Specifically, the constructs of: job relevance, output quality, result demonstrability and the perceived ease of use and their relationships with schools differing in levels of collective efficacy will be presented in the following section.

Job Relevance results and interpreation

Schools differing in levels of collective efficacy were found not to differ in levels of job relevance of use of the World Wide Web / Internet in the classroom. Venkatesh and Davis (2000) suggested that the job relevance construct was analogous to a "person-job fit," in that individuals use it as a "system-job fit" (p. 200). This refers to teachers' perceptions of his or her job performance resulting from using the World Wide Web / Internet. The finding of non significant results regarding the use of the World Wide Web / Internet in the classroom is consistent with Rowand (2000) summary of the United States National Center for Educational Statistics finding that while 99 per cent of teachers

have access to the computers and the Internet in their school, 39 per cent are using are using the Internet to create instructional material, 34 per cent are using computers for record keeping and 10 per cent are using the Internet to access lesson plans or research. The perception of the World Wide Web / Internet is a tool for personal or general use, but not for classroom use seems to be the predominant view of teachers currently teaching.

Output Quality results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of output quality of use of the World Wide Web / Internet in the classroom. Venkatesh and Davis (2000) defined output quality as users' judgments about how well a system performed its tasks. Inherent in this definition is the potential of selecting a different system to replace the one under consideration. In the case of the World Wide Web / Internet no alternative system exists, so the potential of judging in favour of an alternate system is unrealistic. The relationship of this construct into an investigation of the World Wide Web / Internet use in the classroom may have to be reconsidered as to its applicability.

Results Demonstrability results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of results demonstrability of use of the World Wide Web / Internet in the classroom. The results demonstrability construct represents the extent to which teachers will see the "tangibility of the results" of using the World Wide Web / Internet (Venkatesh & Davis, 2000, p. 192). Previous researchers have defined tangibility as clear, measurable and observable results. The key issue with this construct is that teachers *clearly* see the benefit of using the system in their job, if a gain in job performance is not clear than the

results even if they are positive will not be understood. This may be the case with the present findings; teachers may be unclear as to a gain that using the World Wide Web / Internet in classroom instruction would afford them and as such are not using it. Indeed, as Hackerman and Oldham (1976) suggest knowledge of the actual results of work activities is a critical psychological state in the job characteristic model of work motivation. Teachers may be unclear as to what results using the World Wide Web / Internet in the classroom could have and are not motivated to explore it.

Perceived Ease of Use results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of perceived ease of use of the World Wide Web / Internet. Davis (1989) defined perceived ease of use as the degree to which a user believes that using a specific "computer system will be free of effort" (p. 320). Venkatesh and Davis (2000) expanded this definition and included "an increase in job performance" in it (p. 192). The results of investigation of this construct in the present research may offer support for this inclusion of this second component into the definition. Teachers may see the World Wide Web / Internet not as a means to increase job performance but as a 'new way to achieve the same thing' and a way that may not be applicable to most classroom applications.

Summary of Cognitive Instrumental Processes Constructs

None of the determinants of the perceived usefulness construct: job relevance, output quality, result demonstrability and the perceived ease of use were found to have a significant relationship with schools with differing levels of collective efficacy. These constructs represent the TAM2 model's cognitive judgements, or mental representations, an individual has about the applicability of a computer system to the job he or she is

doing. Taken together these results suggest that even thought the World Wide Web / Internet may be representative of greater computer literacy, as suggested by SEI (2000), teachers may perceive the World Wide Web / Internet as inapplicable to classroom instruction. The results of the analysis of relationship of one of the fundamental determinants of the computer acceptance, the perceived usefulness construct with schools differing in levels of collective efficacy will be reviewed next.

Perceived Usefulness results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of perceived usefulness of the World Wide Web / Internet in the classroom. Davis (1989) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Due to the majority of theoretical determinants: subjective norm, job relevance, output quality, results demonstrability, of this construct having non-significant relationships with schools' differing levels of collective efficacy there is little rationale for the proposition that the relationship would be different for this construct than the majority of its' determinants . The findings from this study support this proposition.

The majority of participants' ages may also have played a role in the finding of no statistical significant difference in schools differing in levels of collective efficacy and their perceptions of the perceived usefulness of the World Wide Web / Internet in the classroom. Davis (1989) suggested that demographic characteristics of a sample represent external factors that may influence the perceived usefulness of a specific computer application. Teaching experience may represent just such a variable in the present research. Davis' teaching experience suggestion combined with Rowand's (2000)

findings that newer teachers were more likely to use the World Wide Web / Internet to accomplish various teaching objectives supports the finding of no relationship between collective efficacy and perceived usefulness of the World Wide Web / Internet. The participants in this study were predominantly over the age of 35 (77%). This sample of teachers is likely to be experienced. With a greater level of teaching experience present in this sample, participants would be less likely to view the World Wide Web / Internet as an instrument useful for classroom instruction. Teaching experience is an area future research should address.

Intention to Use results and interpretation

Schools differing in levels of collective efficacy were found not to differ in levels of intention to use the World Wide Web / Internet in the classroom. To interpret the results of question we need to revisit the precursor to the TAM2; the Theory of Reasoned Action as proposed by Fishbein and Ajzen (1975). Fishbein and Ajzen (1975) proposed that intentions to perform a behavior, is a function of two basic determinants, (1) individual attitudes toward the behavior and (2) social norms. Attitudes towards the behavior are determined by beliefs about the consequences of the behavior and the social norms or the individual group norms built up around the specific behaviour. For this study, the combination of results from the social influence processes – the attitudinal determinants, the cognitive instrumental processes - the intention determinants, and the perceived usefulness perceptions from participants offers support for the theoretical attitude – intention – behaviour progression of adoption of computer technology.

However before these results of this final research question as to whether schools differing in levels of collective efficacy differ in their acceptance of computer

technology, defined through the TAM2 subscales are interpreted too broadly, two fundamental concerns with the present research need to be addressed; low sample size and generalizability. Generalizability questions, such as differing elements of school culture, sample subject specialization, school selection criterion need to be discussed in terms of applicability of these research findings. Low sample size and its effects on statistical analysis and interpretation need to be discussed. A discussion of these issues, along with a series of recommendations for following up this research study is presented in the following sections.

Implications for Future Research

Elements such as school culture, teachers' subject specializations and the sample size suggest that the results of this study need to be interpreted cautiously.

Elements of school culture

Due to this study only surveying High School teachers, other elements of a school's culture, that shape a schools' overall social culture and the influences they may have were not examined. Influence, such as that of the leadership style of principals, was not addressed. Principals and the working relationship they have with their staff and their attitudes towards technology integration is a variable that may have eclipsed the influence of the collective atmosphere of teachers alone. The influence of technology leadership in the school system as discussed by O'Conner, Goldberg, Russell, Bebell and O'Dwyer (2004) currently is seen as an obstacle to the integration of computer technology. The findings of their study of administrators, principals, teachers and students emphasizes the strength of this influence and suggest its investigation is a necessary component in a

further investigation of the relationship of a schools collective efficacy and it's acceptance of computer technology.

Additionally, teachers access to the World Wide Web / Internet in the classroom need to be investigated. O'Connor and her colleagues (2004) reported that in Massachusetts school districts, teachers in the higher grades have less access to the World Wide Web / Internet in their classrooms than teachers in the lower and middle grades. The differing elements of school culture and the differing amounts of influence associated with each and access to the World Wide Web / Internet are issues that future research in this area will need to incorporate into their investigations.

Subject specialization

Participants' subject specialization may have contributed to the present research results. Due to the research sample comprising a large representation of English teachers (25 %) the generalizability of this research must be addressed in future research. At a high school level, due to the nature of their subject specializations, English teachers may represented a group with a large amount of computer knowledge, skills and experience but whose subject specialization would not necessarily value use of the World Wide Web / Internet. English teachers, due to a greater exposure to computer applications, such as word processing, may have influence the computer knowledge and experience levels reported by this sample. This predominant percentage of English teachers may have computer knowledge and experience levels not representative of a school's entire teaching staff. Due to this greater representation of English teachers in this sample, this research cannot be generalized to a different sample which may place greater value on

World Wide Web / Internet usage such as computer science teachers. Future research should stratify samples to more accurately reflect a schools teaching population.

School sampling criteria

The sampling criterion adopted for the present research included elements designed to control for location, Internet connection, computer support and instructional level, but access to the Internet and school size was not. Research from Ertl and Plante (2004) suggested school systems and school size may affect computer connectivity to the World Wide Web Internet. They found that Canadian public schools had a slightly higher proportion of World Wide Web / Internet connections than Canadian private schools, 93 per cent and 85 per cent respectively, whereas smaller schools reported a slightly smaller number of computers connected to the Internet. The relationship between internet access and patterns of Internet use is supported by Veehof, Neogi and Van Tol (2003). Future research needs to address amount of access that teachers have to the internet.

An additional element for future research to address is the consideration of school size. Ertl and Plante's (2004) research suggests that school size influences computer connections to the Internet. They discovered that smaller schools (those with less than 300 students) reported 88 per cent of their computers connected to the Internet while larger schools (those of 700 students or more) reported 94 per cent of their computers connected to the Internet. School size and its' potential limiting effect on number of computers connected to the World Wide Web / Internet need to be equated in future research.

The question of school size and World Wide Web / Internet connectivity seems to indicate the emphasis schools put on helping teachers learn computer technology. This

suggestion coincides with the proposition that smaller schools, due to having a more informal structure, place little emphasis on strategies to help teachers use computer technology (Ertl and Plante, 2004). This is a concern future research needs to address.

Another concern regarding school size may be is the size of student population. Student teacher ratios and the differing amount of demands placed on teachers by a larger student population may have a limiting affect on the interaction time teachers may have been able to share, creating a larger more disperse teaching community less able to share knowledge with colleagues.

The various aspects of school size's affect on accepting computer technology, such as access, number of computers connected and student – teacher interaction time, are issues that needs to be addressed in further research. Future research could determine school size and equate schools before initiating participant recruitment so that the influence of these variables could be controlled.

Sample Size

Due to the small sample size and a very low response rate, 68 subjects in 5 schools, results from this study need to be interpreted cautiously. Interpretation problems and the influence of extreme scores on the sample sizes both lead to interpretation problems and the recommendation that the results of this research be interpreted cautiously.

For example, the present sample's results indicate interpretation problems inherent in small samples. 35 females and 25 males participated in this research, but due to 9 participants not responding to this question, an interpretation of gender would be very suspect from this study. The missing data created two possible sampling situations: a

majority of females or a nearly equal number of male / female respondents. Due to the missing data, two equally possible sampling scenarios are possible with this sample and generalizations concerning gender would have to be done very cautiously.

Additionally, the small sample size of this study adds to concerns of the generalizability of this study. Due to a smaller sample having greater potential to contain an extreme score and the influence of an extreme score increasing the chance of finding an effect that may not be found in a larger sample the results of this study must be generalized cautiously.

Measurement Error

Measurement error may also have affected the current research findings. The categorization of the schools by their collective efficacy scores created groups separated by a score difference of .09. This slight difference between groupings may be the result of measurement error. A larger sample may reduce the potential for the groupings separated on such a slight difference that could be the result of a measurement error.

Conclusion

The rationale for this research grew from the 1999 Saskatchewan Provincial Learning Assessment discovery that students view teachers as their greatest source of computer knowledge and that students were consistently performing below provincial expected levels, specifically in activities involving the Internet. Specific concerns regarding student's use of the World Wide Web / Internet grew during the Saskatchewan Education Indicators (2000) finding that students who have a greater familiarity in using the Internet, overall, have greater computer related skills than other students. This finding combined with students identification of teachers as their greatest source of information

stressed that in an investigation of computer use in Saskatchewan, teachers' view of computers and acceptance of the World Wide Web / Internet were crucial elements.

The results of this research suggest three things: (a) teachers view computers as tools for general use not for instructional use, (b) teaching colleagues and school leadership are important factor in the understanding of teachers' relationships towards computers and (c) resistance to using the World Wide Web / Internet in classroom does exist. However, due to elements such as a small sample size, missing data, measurement error and subject specialization concerns, the results from this research have to be generalized cautiously. Further investigations into the influence a schools collective efficacy plays on acceptance of the World Wide Web / Internet by teachers need to address these concerns.

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Appendices

Appendix A - Ethics Application to the University of Saskatchewan

Application for Approval of Research Protocol

University Advisory Committee on Ethics in Human Experimentation

Behavioural Sciences Committee

1. **Department** – Educational Psychology and Special Education

   Supervisor – Dr. Brian Noonan – Department of Educational Psychology and Special Education

   1a. Researcher – Keith Owre – student researcher, Educational Psychology and Special Education.

   This study is being conducted for partial fulfillment of the requirements for a graduate degree from the University of Saskatchewan.

   1b. Anticipated Start Date of research phase of this study – January 2005. Anticipated completion date of this study – April 2005

2. **Title of the Study**

   The Effect of Collective Teacher Efficacy on Teachers' Technology Acceptance.

3. **Abstract**

   The purpose of this study is to investigate the influence of academic culture, defined as collective school efficacy, on the acceptance or the rejection of computer technology. The foundation for this study arose from the 1999 Saskatchewan Provincial Learning Assessment Program, which identified Saskatchewan students as consistently performing below expected provincial levels and teachers as the greatest source of their computer knowledge. The empirical background for this investigation of teachers' acceptance of computer technology derives from two sources, Goddard's (2001) Collective Efficacy construct, and the Technology Acceptance Model 2, proposed by Venkatesh and Davis (2000). These two constructs will be utilized to investigate the relationship between group membership and computer acceptance of teachers participating in this study.

4. **Funding**

There is no funding available to support this research so any expenses incurred in the course of this study will be absorbed by the researcher.

5. Participants

Data will be collected from High School teachers in the Saskatoon High Schools through two survey instruments - (refer to Appendices C and D respectively)[6] and a demographics form - (refer to Appendix E). These research instruments along with a letter of invitation, outlining the purpose of the study and inviting teachers to participate in this study will be distributed to the high school teachers by their school principals (refer to Appendix B – Invitation to teachers to participate).

6. Consent

The cover letter distributed to all teachers as part of the research package, will state that by completing the demographic questionnaire and survey instruments they are giving their informed consent to participate and permission for the researcher to utilize data in the manner described. As well the cover letter will inform participants of their right to not answer any specific question and withdraw from the study at any point.

6b. Organizational Consent

Additional approval to conduct this research will be obtained from two other ethics boards: the Saskatoon Public School Boards and the Saskatoon Catholic School Board before any attempt to recruit participants is initiated (refer to Appendix E - Cover Letter to Public School Board and Catholic School Boards).

7. Methods and Procedures

Permission for their teaching staff to participate will be sought from principals of the High Schools in Saskatoon. The study will be outlined to the principals with respect to: purpose of the study, the survey instruments used in the study, their teaching staff's role in the study and the distribution role that each principal will be asked to play in their school. The distribution role will be assumed by the principals to be least disruptive to both participants and participating schools. Principals, additionally will be asked to allow the researcher to establish a collection point for completed research packages in the schools main office.

Each research package distributes to the teachers will contain: an introduction letter, a demographics form, and two survey instruments, all within a large blank envelope. The introduction letter will outline the purpose of the study, describe what their individual participation will consist of in terms of rights and responsibilities if they agree to participate, the order the research forms should be

[6] Refer to Appendix F for e-mail permission from the researchers who developed the two survey instruments to allow their instruments be used for the purposes of this study.

completed, instruction of how their data should be returned to the researcher and how summary reports of the results of this study will disseminated.

Prior to participating in this research, participants will be informed, in the introduction letter, that any reports of data will be in an aggregate form only, neither any specific individual nor any particular school will be identified.

8. Storage of Data

All data collected during the course of this study will be stored in the researcher's locked office on the University of Saskatchewan campus. Upon completion of this study, the raw data and a copy of the aggregated data, will be stored in a locked filing cabinet by the faculty supervisor, Dr. Brian Noonan, for a minimum of five years, consistent with University of Saskatchewan regulations.

9. Dissemination of Results.

The primary purpose for collection and analysis of this data is for the completion of master thesis and degree. However, the data may be utilized in an aggregate form for either a conference presentation, journal article or both. Additionally a final summary report of the results of this research will be shared with the schools participating in this study.

10. Risk or Deception.

There are no known risks, side effects or discomforts associated for the anticipated research participants of this study. Also, no deception is involved in any component of this study.

11. Confidentiality

Final data will be reported in aggregate form only. Data, from the two surveys and the demographics questionnaire, gathered during the course of this study will not have any names or other identifying information attached to them. Additionally any final reports of data will refer to the data collection sites; High Schools in Saskatoon, as High Schools in a Western Canadian city.

Confidentiality will be maintained during data collection by asking participants to enclose the data collection forms in a large envelope, seal it and returned it to a sealed box in the schools main office. Additionally, both the research packages and the collection box will be marked "Confidential - Research".

12. Data/Transcript Release

There is no issue of compromised anonymity in this study.

13. Debriefing and Feedback

The debriefing is generally provided for in the text of the letters of introduction.

A summary report will be provided to the participating institutions, including the schools and the school board offices. Individual participants will be supplied with an e-mail address through which they may request a summary report.

14. Required Signatures:

_____	_____
Date	Researcher
_____	_____
Date	Faculty Supervisor
_____	_____
Date	Department Head

15. Contact Information:

Dr. Brian Noonan, Faculty Supervisor
Telephone: 966 – 5265
E-Mail: brian.noonan@usask.ca
Address:
c/o Educational Psychology and Special Education, Department office
College of Education
University of Saskatchewan, 28 Campus Drive
Saskatoon, SK.,
S 7 N 0 X 1

Keith Owre, Researcher
Phone: 966 - 7595
E-mail: kpo136@mail.usask.ca
Address:
c/o Educational Psychology and Special Education, Department office
College of Education
University of Saskatchewan, 28 Campus Drive
Saskatoon, SK.,
S 7 N 0 X 1

Appendix B – Ethics Application to the Public School Board

Cover Letter to Public School Board

My name is Keith Owre. I am a graduate student at the University of Saskatchewan in Educational Psychology. I am contacting you to seek permission to conduct a survey of the high school teachers in your school. In addition to applying to your school board, my research ethics application is currently being reviewed and processed by the University Advisory Committee on Ethics in Human Experimentation Behavioural Sciences Committee and I will forward you a copy of their letter of approval as soon as possible.

The purpose of my research is investigating the relationship between High School culture and its' influence on acceptance of computer technology. Past research, such as Bandura (1997) has demonstrated that general group perceptions may influence specific individual perceptions.

Prior to the data collection in each school I will meet, individually, with the High School principals to review my research with respect to: the purpose of the study, the survey instruments, their teaching staff's role, the distribution of research materials in each school and to establish a research collection point in the school's main office. Distribution of research materials in each school will consist of principals using their normal mail distribution network to dispense sealed research packages to their teaching staff.

Participation in my research will take 20 minutes. A letter of introduction will outline the purpose of the study, participant's rights, in terms of – their voluntary participation, their informed consent, their right to withdraw, their right to confidentiality and dissemination of the final results of the research. Participation will consist of reading and completing two survey instruments and a demographics questionnaire.[7] Completed research packages will be returned to collection boxes in the school's main office. The collection box will remain in each school for 4 weeks, during which time the researcher will, weekly, collect completed research packages.

Results of this research will be provided to the participating institutions, including the various schools and school board offices. Individual participants will be supplied with an e-mail address through which they may request their own copy of the summary report.

Any questions or concerns related to this research, now or at a later date, may be directed to the researcher (Keith Owre, at 966 – 7595), or the researcher's supervisor, Dr. Brian Noonan (966 – 5265), Department of Psychology and Special Education, University of Saskatchewan.

[7] The survey forms and letter of introduction to both the principals and teachers will be found appended to the formal research applications: Agenda for Meeting with the Principals – Appendix A, Invitation to Teachers to participate – Appendix B, the two survey instrument – Appendix C and D, Demographics Form – Appendix E.

Application Form for Permission to Conduct Research in Public Schools

Completed application forms are submitted to Coordinator Research and Measurement.

Applicant(s)

Name: Keith Owre
Address:
c/o Educational Psychology and
Special Education,
Department Office – College of Education
University of Saskatchewan, 28 Campus Drive
Saskatoon, SK.
S 7 N 0 X 1

Telephone 966–7595 Home: 374-0883
Present Position: M. Ed. Student
Department of Educational
Psychology and Special
Education.

If the study is a requirement for a degree, please specify which degree:

This study is being conducted for partial fulfillment of the requirements for a graduate degree from the University of Saskatchewan.

Will applicant actually conduct study: Yes ✔ No ____

If NO, please give name, position and qualifications of person(s) who will conduct the study:

Description of Proposed Study

Title of Study:
The Effect of Collective Teacher Efficacy on Teachers' Technology Acceptance.

Statement of Problem/Research Question:

The purpose of this study is to investigate the influence of academic culture, defined as collective school efficacy, on the acceptance or the rejection of computer technology. The foundation for this study arose from the 1999 Saskatchewan Provincial Learning Assessment Program, which identified Saskatchewan students as consistently performing below expected provincial levels and teachers as the greatest source of their computer knowledge. The empirical background for this investigation of teachers' acceptance of computer technology derives from two sources, Goddard's (2001) Collective Efficacy construct, and the Technology Acceptance Model 2, proposed by Venkatesh and Davis (2000). These two constructs will be utilized to investigate the relationship between group membership and computer acceptance of teachers participating in this study.

Significance of Study: (i.e. How could this study contribute to the improvement of education in Saskatoon Public Schools?)

This study could further understanding of teachers' resistance to computer technology. This study will investigate whether resistance to computer technology, specifically – the World Wide Web, exists in Saskatoon Public High Schools and if it does exist, is this resistance related to overall school culture.

Research Methodology: (Please check the appropriate boxes)

✓ Questionnaire _____ Participant Observation

_____ Individual Interview _____ Data Analysis

_____ Focus Group ✓ Other (Specify)

Research packages, consisting of the surveys and questionnaire comprising this study will be distributed to the teachers through their schools mail system and collection points will be established in each school to retrieve completed questionnaires. (Refer to Appendix C - Form C – Collective Teacher Efficacy Scale and Appendix D – Form D Technology Acceptance Model 2 for the survey items and Appendix E – Form E Demographics Questionnaire).

Intended Use of Results: (Please check the appropriate boxes)

✓ Published as a Master's Thesis/project _____ Not Published

_____ Published as a Master's Thesis/project _____ Other

_____ Published in a Scholarly Journal

Participants

Number of participants desired who are (please check the appropriate boxes)

_____ Pupils: Number _____ Grade _____ Time _____

✓ Teachers: Number 337 Time 20 Minutes

_____ Principals: Number _____ Time _____

✓ Other (specify) - The researcher will review, individually, with each principal this study's purpose and research materials to obtain approval to conduct this research in their school. Additionally, principals will be asked to allow the researcher to distribute research materials through their school's mail system and establish a collection point for return of completed questionnaires.(Refer to Appendix A - Agenda for Meeting with High School Principals for items to be discussed with each principal).

Proposed school sites (indicate name if possible)

School A
School B
School C
School D
School E

Will the researcher work with the participants: (please check the appropriate boxes).

_____✔_____ Individually _____ Small Groups _____ Entire Class

Research packages will be distributed to teachers through their school's mail system and returned to a collection point in the schools main office after completion.

TIMEFRAME
Proposed Dates for: Commencing: Feb. 01/05 Completing: March 01/05.

REQUIRED ATTACHMENTS
_____ Copies of consent forms.
_____✔_____ Copies of all tests, questionnaires or interview questions that will be give to the subjects.
_____✔_____ A signed letter or certificate of approval from the appropriate ethics review committee. (This will be forwarded as soon as possible)
_____ Information package provided to ethics committee.

UNIVERSITY AUTHORIZATION
This application, the research design and instruments mentioned herein have been approved by:
Faculty Advisor's Name _____ University _____

Faculty Advisor's Signature: _____ Date _____

COMMITMENT OF RESEARCHER(S)

_____✔_____ I am willing to provide a final report of my study to the Saskatoon Public Schools.
_____✔_____ I agree to adhere to the ethical standards and procedures as outlined in my application package.
_____✔_____ I agree to seek permission to make any changes in the methodology outlined in this application.

Date _____ Signature _____

Appendix C – Ethics Application to the Catholic School Board

To:
Superintendent Learning Services
Catholic Schools

I am contacting you to seek permission to conduct a survey of the high school teachers in the Saskatoon Catholic School system. The title of my research is "The Effect of Collective Teacher Efficacy on Teachers' Technology Acceptance", and the purpose is to investigate the relationship between the collective efficacy of High School teachers and their acceptance of computer technology. Past research, such as Goddard (2001) has demonstrated that collective efficacy may influence specific educational variables.

The initial step in my research is to obtain permission from the various High School principals to conduct my research in their schools. I will meet, individually, with the High School principals to review my research with respect to: the purpose of the study, the survey instruments, their teaching staff's role, the distribution of research materials in each school and to establish a research collection point in the school's main office (refer to Appendix A – Agenda for Meeting with the Principals). Distribution of research materials in each school will consist of principals using their normal mail distribution network to dispense sealed research packages to their teaching staff.

Participation in my research will take 20 minutes. A letter of introduction will outline the purpose of the study, participant's rights, in terms of – their voluntary participation, their informed consent, their right to withdraw, their right to confidentiality and dissemination of the final results of the research (refer to Appendix B – Invitation to Teachers to participate). Participation will consist of reading and completing two survey instruments and a demographics questionnaire (refer respectively to Appendix C and D and Appendix E). Completed research packages will be returned to collection boxes in the school's main office. The collection box will remain in each school for 4 weeks, during which time the researcher will, weekly, collect completed research packages.

Results of this research will be provided to the participating institutions, including the various schools and school board offices. Individual participants will be supplied with an e-mail address through which they may request their own copy of the summary report.

In addition to applying to your school board, my research ethics application is currently being reviewed and processed by the University Advisory Committee on Ethics in Human Experimentation Behavioural Sciences Committee and I will forward you a copy of their letter of approval as soon as possible.

Any questions or concerns related to this research, now or at a later date, may be directed to the researcher (Keith Owre, at 966 – 7595), or the researcher's supervisor, Dr. Brian Noonan (966 – 5265), Department of Psychology and Special Education, College of Education, University of Saskatchewan, 28 Campus Drive, Saskatoon, SK.

Appendix D – Ethics Approval from the University of Saskatchewan

UNIVERSITY OF SASKATCHEWAN
Behavioural Research Ethics Board (Beh-REB)

NAME: Brian Noonan, Educational Psychology and Special Education
Keith Owre

Beh 05-10

DATE: 16-Feb-2005

The Behavioural Research Ethics Board (Beh-REB) has reviewed the Application for Ethics Approval for your study "The Effect of Collective Teacher Efficacy on Teachers' Technology Acceptance" (Beh 05-10).

1. Your study has been APPROVED.
2. Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Committee consideration in advance of its implementation.
3. The term of this approval is for 5 years.
4. This approval is valid for one year. A status report form must be submitted annually to the Chair of the Committee in order to extend approval. This certificate will automatically be invalidated if a status report form is not received within one month of the anniversary date. Please refer to the website for further instructions http://www.usask.ca/research/behavrsc.shtml

I wish you a successful and informative study.

Dr. Valerie Thompson, Chair
Behavioural Research Ethics Board (Beh-REB)

Office of Research Services, University of Saskatchewan
Room 1607, 110 Gymnasium Place, Box 5000 RPO University, Saskatoon SK S7N 4J8 CANADA
Telephone: (306) 966-8576 Facsimile: (306) 966-8597
http://www.usask.ca/research

Appendix E - Agenda for Meeting with High School Principals

Good Day School Principal

My name is Keith Owre. I am a graduate student at the University of Saskatchewan in Educational Psychology and I am completing the thesis portion of my degree. The reason that I am meeting with you today is I am seeking your permission to conduct a survey of the high school teachers in your school. I have received permission from the University Advisory Committee on Ethics in Human Experimentation Behavioural Sciences Committee on *Month, Day, Year*, the Public School Board and the Saskatoon Catholic School Board to conduct this research in the various High Schools in Saskatoon. I am seeking your permission to conduct my research in your school. The purpose of my research is investigating the relationship between school culture and its' influence on acceptance of computer technology.

Participation in my research consists of High School Teachers in your school completing a research package containing:

1. A letter of introduction explaining the study and what their participation would entail:
    a. Their rights and responsibilities with respect to:
        i. voluntary participation and informed consent
        ii. confidentiality – individually and collectively of their school.
        iii. reports of final results
    b. The time the research should take to complete.
    c. The method for returning completed data to the researcher.
    d. The use of the completed data for completion of a M. Ed. degree.
2. Two survey instruments and a demographics form (refer to attached copies).

Agreement to conduct my research would entail distributing research packages to the teachers within you school through you normal mail delivery channels and establishment of a collection point, a cardboard box, for the return of completed questionnaires within you main office. Completed data forms would be collected weekly for a period of 4 weeks from this collection point. At the end of this time the data collection phase would be completed and the data collection box would be removed from your office.

If you have any questions or concerns related to this research, please contact the researcher (Keith Owre, at 966 – 7595), or Dr. Brian Noonan (966 – 5265), Department of Educational Psychology and Special Education, University of Saskatchewan.

Appendix F – Invitation to Teachers to participate

Greetings

My name is Keith Owre. I am a graduate student at the University of Saskatchewan, completing a thesis in Educational Psychology and Special Education. I am contacting you to ask for your voluntary participation in my research; an investigation of the relationship between group and individual perceptions of computer technology.

I have received permission from the University Advisory Committee on Ethics in Human Experimentation, Behavioural Sciences Committee and the Public School Board to conduct this research. Also, I have reviewed this study with your principal and received permission to seek your voluntary participation.

If you agree to participate, the enclosed questionnaires should take no longer than 15 minutes to complete. By completing the forms in the research package you are signifying your informed consent to participate and granting the researcher permission to utilize the data. If at any point you feel uncomfortable answering a question, skip that question and move to the next or you may withdraw from the study entirely, without any penalty or consequence. Participation consists of reading and filling out the surveys in the research package:

1) **Form C - Collective Teacher Efficacy Scale -** Read and respond to each statement on this form with an indication of your level of agreement.
2) **Form D: Technology Acceptance Model 2**. Read and indicate your level of agreement with each statement. (For **Form C** and **Form D** there are no correct or incorrect answers, your frank opinion is what is being sought.)
3) **Form E: Demographics Form.** The method of answering questions on this form will change from: filling in a blank, choosing a single statement that best describes you, to rating of a series of statements. Please read and follow the instructions carefully.

All individual responses and specific school identities will be kept strictly confidential and the results will be reported in an **aggregate or group form only.** Please ensure that upon completion the large information package envelope contains, Forms: C, D, and E. Seal this package and returned to the collection box, labeled **"Confidential – Research"** in your schools main office.

A summary report of the findings from this research will be provided to participating schools. If you would like a personal copy of the findings you can e-mail the researcher at **kpo136@mail.usask.ca.** and request a personal copy of the summary report.

Please, if you have any questions or concerns related to this research contact the researcher (Keith Owre, at 966 – 7595), or Dr. Brian Noonan (966 – 5265), Department of Psychology and Special Education, University of Saskatchewan. Questions regarding your rights as a participant should be addressed to the University of Saskatchewan Behavioural Science Research Ethics Board (966 – 2084).

Thank you very much for your attention, consideration and time in participating in this research study.

Appendix G – Goddard and Hoy (2001) Collective Teacher Efficacy Scale

The Effect of Collective Efficacy on Teacher's Technology Acceptance

Greetings

Thank you for participating in my research study. This study should take no longer than 20 minutes to complete, I will have to ask that you read and fill out the various survey forms using either a dark pen or pencil as this provides the most legible results. Some of the questions will ask you to answer with either specific numbers or words, please print your responses to these questions. The majority of questions will ask you to fill in a bubble. To change an answer, place an "X" through the answer you wish to change and then fill in the circle of your new choice. Please do not use white out.

Examples of answering

Do	I believe today is a sunny day.	
Corrected Response	I believe today is a sunny day.	
DON'T Respond in this manner	Please do not use checks or slashes	

Form C - Collective Teacher Efficacy Scale

Directions: Indicate your level of agreement with each of the following statements from STRONGLY DISAGREE (1) to STRONGLY AGREE (6), by marking an (●) in the box, at the right of each statement, that best represents your level of agreement.

	Strongly Disagree		Disagree	Agree		Strongly Agree
1. Teachers in this school have what it takes to get the children to learn.	1	2	3	4	5	6
2. Teachers in the school are able to get through to the most difficult students.	1	2	3	4	5	6
3. If a child doesn't learn something the first time teachers will try another way.	1	2	3	4	5	6
4. Teachers here are confident they will be able to motivate their students.	1	2	3	4	5	6
5. Teachers in this school truly believe every child can learn.	1	2	3	4	5	6
6. If a child doesn't want to learn teachers here give up .	1	2	3	4	5	6
7. Teachers here need more training to know how to deal with these students.	1	2	3	4	5	6
8. Teachers in this school think there are some students that no one can reach.	1	2	3	4	5	6

9. Teachers here don't have the skills needed to produce meaningful student learning.	①	②	③	④	⑤	⑥
10. Teachers here fail to reach some students because of poor teaching methods.	①	②	③	④	⑤	⑥
11. These students come to school ready to learn.	①	②	③	④	⑤	⑥
12. The lack of instructional materials and supplies makes teaching very difficult.	①	②	③	④	⑤	⑥
13. The students here come in with so many advantages they are bound to learn.	①	②	③	④	⑤	⑥
14. Students here just aren't motivated to learn.	①	②	③	④	⑤	⑥
15. The quality of school facilities here really facilitates the teaching and learning process.	①	②	③	④	⑤	⑥
16. The opportunities in this community help ensure that these students will learn.	①	②	③	④	⑤	⑥
17. Teachers here are well-prepared to teach the subjects they are assigned to teach.	①	②	③	④	⑤	⑥
18.Teachers in this school are skilled in various methods of teaching.	①	②	③	④	⑤	⑥
19. Learning is more difficult at this school because students are worried about their safety.	①	②	③	④	⑤	⑥
20. Drugs and alcohol abuse in the community make learning difficult for students here.	①	②	③	④	⑤	⑥
21. Teachers in this school do not have the skills to deal with student disciplinary problems.	①	②	③	④	⑤	⑥

Appendix H – Venkatesh and Davis (2000). Technology Acceptance Model 2

Form D - Technology Acceptance Model 2

Questions in this section concern your reactions to your professional use of world wide web/internet. By the world wide web/internet we **mean any internet searches, any downloading of: files, books, articles, any use of multimedia and so on.**

Directions: Indicate your level of agreement with each of the following statements from STRONGLY DISAGREE (1) to STRONGLY AGREE (7), by marking an (●) in the circle at the right of each statement that best represents your level of agreement.

	Strongly Disagree ①	Moderately Disagree ②	Somewhat Disagree ③	Neutral ④	Somewhat Agree ⑤	Moderately Agree ⑥	Strongly Agree ⑦
1) Assuming I have access to the world wide/ internet, I intend to use it.	①	②	③	④	⑤	⑥	⑦
2) Given that I have access to the world wide web/internet, I predict that I would use it.	①	②	③	④	⑤	⑥	⑦
3) Using the world wide web/internet improves my performance in my job.	①	②	③	④	⑤	⑥	⑦
4) Using the world wide web/internet in my job increases my productivity.	①	②	③	④	⑤	⑥	⑦
5) Using the world wide web/internet enhances my effectiveness in my job.	①	②	③	④	⑤	⑥	⑦
6) I find the world wide web/internet to to be useful in my job.	①	②	③	④	⑤	⑥	⑦
7) My interaction with the world wide web/ internet is clear and understandable.	①	②	③	④	⑤	⑥	⑦
8) Interacting with the world wide web/ internet does not require a lot of mental effort.	①	②	③	④	⑤	⑥	⑦
9) I find the world wide web/internet easy to use.	①	②	③	④	⑤	⑥	⑦
10) I find it easy to get the world wide web/ internet to do what I want it to do.	①	②	③	④	⑤	⑥	⑦
11) People who influence my behavior think that I should use the world wide web/ internet.	①	②	③	④	⑤	⑥	⑦

Answer Key -	Strongly Disagree (1)	Moderately Disagree (2)	Somewhat Disagree (3)	Neutral (4)	Somewhat Agree (5)	Moderately Agree (6)	Strongly Agree (7)
12) People who are important to me think that I should use the world wide web/ internet.	1	2	3	4	5	6	7
13) My use of the world wide web/ internet is voluntary.	1	2	3	4	5	6	7
14) My supervisor does not require me to use the world wide web/internet.	1	2	3	4	5	6	7
15) Although it might be helpful, using the world wide web/internet is certainly not compulsory in my job.	1	2	3	4	5	6	7
16) People in my school who use the world wide web/internet have more prestige than those who do not.	1	2	3	4	5	6	7
7) People in my school who use the world wide web/internet have a high profile.	1	2	3	4	5	6	7
18) Having the world wide web/ internet is a status symbol in my school.	1	2	3	4	5	6	7
19) In my job, usage of the world wide web/internet is important.	1	2	3	4	5	6	7
20) In my job, usage of the world wide web/intern is relevant.	1	2	3	4	5	6	7
21) The quality of the output I get from the world wide web/internet is high.	1	2	3	4	5	6	7
22) I have no problem with the quality of the world wide web/internet output.	1	2	3	4	5	6	7
23) I have no difficulty telling others about the results of using the world wide web/internet.	1	2	3	4	5	6	7
24) I believe I could communicate to others the consequences of using the world wide web/internet.	1	2	3	4	5	6	7

Answer Key -	Strongly Disagree (1)	Moderately Disagree (2)	Somewhat Disagree (3)	Neutral (4)	Somewhat Agree (5)	Moderately Agree (6)	Strongly Agree (7)
25) The results of using the world wide web/internet are apparent to me.	1	2	3	4	5	6	7
26) I would have difficulty explaining why using the world wide web/internet may or may not be beneficial.	1	2	3	4	5	6	7

27) On average, how much time do you spend on the world wide web/internet every day?

Hours _____ Minutes _____

28) I have been using the world wide web/internet for

Months _____ Years _____

Appendix I - Demographics Questionnaire

Form E Demographics - Read each question carefully and respond in a frank and honest manner.

1) How long have you been teaching?

① < 5 years
② 6 - 10 years
③ > 15 years

2) What is your current age?

① < 34
② 35 - 44
③ 45 - 49
④ > 50

3) How long have you been teaching at your present school?

① < 5 years
② 6 - 20 years
③ > 20 years

4) Gender?

① Male
② Female

5) What is your current teaching status?

① Part-time
② Full-Time

6)What is your current teaching assingment?

① Grade 9 ② Grade 10
③ Grade 11 ④ Grade 12

7) How would you rate your experience with computers? (Please choose only one response.)

A) I have never used a computer ①
B) I have never used a computer but would like to learn. ②
C) I use applications like word processing, spreadsheets, etc. ③
D) I use computers in the classroom. ④
E) I use computers for administrative purposes. ⑤
F) Both answers C and D ⑥
G) Both answers C and E ⑦
H) Both answers D and E ⑧
I) Answers C, D and E ⑨

8)How often do you use computers for instruction?

(Please choose only one response.)

① Daily ③ Occasionally

② Weekly ④ Not at all

9) **How often do you use a computer for personal use?**

(Please choose only one response.)

① Daily ③ Occasionally

② Weekly ④ Not at all

10) **How many hours per week do you use computers? (on average)**

①	②	③	④	⑤
< 1 Hr.	2 - 5 Hrs.	6 - 15	16 - 25 Hrs.	> 25 Hrs.

11) **If you use computers for instruction how many hours per week do you use them?**

①	②	③	④	⑤
< 1 Hr.	2 - 5 Hrs.	6 - 15	16 - 25 Hrs.	> 25 Hrs.

12) **If you use a computer what type of training do you have?**

(Please choose only one response.)

A) No training ①
(If this is your response to this question, please check the circle to the right of this statement and proceed to question 14, if not please select another response).

B) Basic computer literacy (on/off operations & how to run software) ②

C) Computer applications such as word processing. ③

D) Computer integration in the classroom curriculum. ④

E) Both answers A and B ⑤

F) Both answers B and D ⑥

G) Both answers C and D ⑦

H) Answers B, C and D ⑧

13) Where did you receive your computer training <u>(RANK ORDER – 1 to 4 - your choices in order of greatest amount of knowledge and skill received. 1 being the source of the greatest amount of knowledge and skill and 4 being the source of the least amount of knowledge and skill.)</u>

(A) Self taught ① ② ③ ④

(B) School district workshop ① ② ③ ④

(C) University ① ② ③ ④

(D) Other ① ② ③ ④

Please specify _____

14) What is the subject area that you predominantly teach? *(Please choose only one response.)*

(A) English ①	(D) Language ④	(G) Arts Education ⑦
(B) Social Sciences ②	(E) Mathematics ⑤	(H) Sciences ⑧
(C) Practical & Applies Arts ③	(F) Physical Education ⑥	(I) Other (Please Specify) ⑨

_____