The impact of a compulsory web-based course on preservice teachers' motivational profile

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ABSTRACT

The goal of this research was to better understand the impact of the implementation of a compulsory Web-based course on preservice teacher motivation. Subjects were enrolled in a four-year teacher education program (n=429) in the province of Quebec (Canada). Our initial hypothesis was that the Web-based distance education course —designed to promote self-determination, affiliation, and a sense of competence— would positively impact the motivation of preservice teachers. Results presented are based on quantitative and qualitative data analysis. They demonstrate that a technologically rich learning environment can enhance motivation after only a few weeks.

KEY WORDS

Motivation, preservice teachers, distance education, on-line courses, autonomy

RÉSUMÉ

Cette recherche avait pour but de mieux comprendre l'impact, sur la motivation des futurs enseignants, de la mise en œuvre de cours obligatoires en ligne. Les sujets ont été inscrits à un programme de formation des enseignants d'une durée de quatre ans (n=429) donné au Québec (Canada). Notre première hypothèse était que le cours de formation à distance en ligne —conçu pour favoriser l'autonomie, l'appartenance et un sentiment de compétence— aurait un effet positif sur la motivation des futurs enseignants. Les résultats présentés sont fondés sur l'analyse de données quantitatives et qualitatives. Ils montrent qu'un milieu d'apprentissage techniquement évolué peut accroître la motivation en quelques semaines seulement.

Mots clés

Motivation, futurs enseignants, formation à distance, cours en ligne, autonomie

Introduction

In the last fifty years, a large number of changes have wrought havoc on society: the arrival of television, new means of transportation, new information and communication technologies. Coupled with the metamorphosis of family structures and social values, these innovations have had a particular impact on students who have come of age in the midst of these societal transformations and this technological revolution. Our changing society, now more and more depending, socially and economically upon information and communication technologies (ICTs), is giving rise to new educational needs as well as to new teaching methods. These new generations have modern needs and expectations which manifest themselves particularly in academic environments such as universities. In fact, at the dawn of the new millennium, teacher education faces numerous challenges: the growing diversity of student profiles, the arrival of new technologies, the multiplicity of university programs, as well as the preservice teachers' lack of interest or motivation to use technology in their own teaching. For example, although computer technology is quickly spreading to almost every part of our lives Zhao and Frank (2003, p. 807-808) argue underline that the introduction of ICTs in schools has been less than successful: «*[…] there were several waves of massive investment in technology to improve education, but none had a significant lasting impact on education. Despite the generous investment in, and increased presence of, computers in schools…, computers have been found to be unused or underused in most schools…*».

As pointed out in the ImpaCT2 study[1], little has change in the past 15 years with regard to teachers' use of ICTs: they are not confident about using ICTs in their own classrooms. Of course, there are indications in the report that teachers are considering taking on a new, more active role but teaching has yet to be significantly influenced by the use of ICTs. That is why Bullock (2004) highlights that the importance of better preparing teachers both to teach and use ICTs has gained national attention over the past three decades. Various studies and governmental reports such as the Teachers and Technology report (U. S. Congress O.T.A, 1995) have strongly emphasized that teacher education colleges imperatively need to improve the effectiveness of their program so that preservice teachers who complete their degree know why, how and when to teach with ICTs. These recommendations

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1. These findings are available at: http://www.becta.org.uk/impact2

are also found in Canadian and European studies and governmental reports. One global recommendation appears to emerge from this reports and studies: ICTs must be part of various (if not most) teacher education courses and faculty members need to act as models with regard to technology integrated teaching.

According to the Economist Intelligence Unit and IBM[2], the world market of open and distance learning should be propelled from 6.6 billion US$ in 2002 to 23,7 billion US$ in 2006. Therefore, open and distance learning, in particular Web-based courses, presently appears to be one of the great focuses of pedagogical innovation in teacher education programs. Furthermore, as these types of distance courses greatly augment the possibilities of network implementation and of individual or group learning, the most basic learning theories and teaching principles such as those of Thorndike (law of effect and law of exercise), of Dewey (learning through action), of Piaget (construction of knowledge) and of Vygotsky (learning as a socio-interactive process) could be applied more readily and especially more often (see Grégoire, Bracewell & Laferrière, 1996).

In light of the challenges issued from university teaching, particularly those pertaining to the students' motivation to learn, the integration of technology into various teacher education courses, but also the importance of modeling teaching with ICTs by teacher education faculty (e.g. Moursund & Bielefeldt, 1999), it was decided to implement a compulsory, distance, web-based course within the teacher training program of a Canadian (province of Quebec) university. The course, Introduction to Educational Research, was not a course technology, but rather an introduction to educational research or educational inquiry designed for future teachers. This was also a very difficult course for preservice teachers as few understand – before the course that is – why it is important to be introduced to educational research in a teacher education program. Nevertheless, this is a compulsory course in most teacher education programs in the province of Quebec because the ministry of Education believes that enlightened educators need to look to and understand education research for well-founded evidence to help them do a better job with the children they serve (e.g. Slavin, 2004). Finally, it should be noted that this was the first compulsory Web-based course in any teacher education program in Canada and that the Quebec University (no matter the program or faculty) had never housed such an experiment in the past.

The goal of the present research was to study and better understand the motivational impact of the implementation of a compulsory Web-based course in a teacher education program. Our starting hypothesis was that this course, with its nature promoting self-determination, feelings of competence and affiliation (Deci & Ryan, 1991; Ryan & Deci, 2000), would have a positive impact on the motivation of the students.

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2. Source: http://eb.eiu.com/upload/ellam.pdf

THEORETICAL FRAMEWORK

Motivation

Motivation, a force that energizes and directs behavior toward a goal (Eggen & Kauchak, 1994), could certainly be perceived as one of the most important psychological concepts in education. In fact, according to Meece (1993), current educational problems go beyond declining achievement scores: most schools today face a crisis in student motivation. Student motivation is critical for learning, and several researchers have found a positive and robust correlation between motivation and achievement to prove it (Urugoglu & Walberg, 1979; Vallerand & Sénécal, 1993). Various studies have attempted to highlight the elements that impact on school motivation. Pintrich and Schunk (1996), among others (Mc Combs & Pope, 1994; Boggiano & Pittman, 1992; Waxman & Walberg, 1991; Stipeck, 1988; Bowen & Madsen, 1978), argue that teaching practices may have a tremendous impact on student motivation, and that they can affect it in many ways.

Since the beginning of the twentieth century, the concept of motivation has been studied according to a variety of perspectives (Overton, 1984; Weiner, 1992). In the last thirty years, many models, approaches and theories have inspired researchers studying motivation and education. According to Pintrich and Schunk (1996), many are the result of modern conceptions of human beings and of the way in which they learn. In addition, three important educational schools of thought seem to guide modern theories of motivation: behaviorism, cognitivism, and humanism. For the past thirty years, most psychologists and educators have agreed that there are two main types of motivation: extrinsic motivation and intrinsic motivation. De Charms (1968) was one of the first researchers to introduce this distinction. More recently, Ryan and Deci (2000) as well as Deci and Ryan (1985; 1991) have argued that behavior can be intrinsically motivated, extrinsically motivated, or amotivated. This theoretical approach, detailed below, has generated a considerable amount of research and appears quite pertinent for the field of education.

Motivation according to Deci and Ryan (1985, 1991, 2000)

Deci and Ryan's motivation theory seems more complete than others as, on the one hand, it emphasizes the dynamic relationship between the individual and his environment and, on the other hand, it is very relevant for educational research (Vallerand, Blais, Brière & Pelletier, 1989). According to the theory of cognitive evaluation (Deci & Ryan, 1991), an individual's motivation is mainly determined by his needs for self-determination and competence. Self-determination is defined as the hypothetical degree of freedom as perceived by the individual in the choice and execution of his actions (Deci & Ryan, 1991). The authors emphasize that there also

exists in individuals an important need for affiliation complementing the need for autonomy, and which is also necessary for the development of self-determined motivation. In fact, Deci and Ryan suggest that everything which is likely to influence these three factors, that is to say the feelings of self-determination, competence and affiliation, would thus have an impact on student motivation.

Feeling of self-determination: the determining principle of motivation

For to Ryan and Deci (2000), feelings of self-determination correspond to individuals' perception of the origin of their actions. If students believe that they have chosen their behavior, their feelings of self-determination will be heightened. The context in which the task is achieved is then perceived as promoting autonomy. Conversely, if students believe that their behavior is a result of external induction, their feelings of self-determination are weakened and the context in which the task was accomplished will be perceived as controlling. A stronger feeling of self-determination will have a positive impact on the development of a student's academic motivation, whereas the opposite will have a negative impact.

Feeling of competence: second determining principle of motivation

According to Ryan and Deci (2000), the second determining principle of motivation is the perception or feeling of competence. This element may be defined as a complex affective state, which is relatively stable, lasting and linked to an individual's representation of his aptitude, of his competence in regards to a given activity. Events which help individuals to feel competent increase their self-determined types of motivation. On the contrary, events which undermine individuals' feelings of competence decrease their self-determined types of motivation. Many contextual factors can affect students' perception of competence and, consequently, their academic motivation «*curriculum, class structure and the teacher represent the sources of influence which may influence motivation*» (Vallerand, 1993, p. 267).

Intrinsic motivation, extrinsic motivation and amotivation

In general, intrinsic motivation (IM) refers to the fact of doing an activity for itself, and to the pleasure and satisfaction derived from participation (Deci, 1975). Contrary to IM, extrinsic motivation (EM) pertains to a wide variety of behaviors in which the goals of an action extend beyond those inherent in the activity itself. They are behaviors which are engaged in as means to an end and not for their own sake (Deci, 1975). Originally, it was thought that EM referred to behaviors performed without self-determination and thus could only be prompted by external contingencies. However, Deci, Ryan and their colleagues (1985, 1991, 2000) have postulated a self-determination theory. This theory seems particularly relevant for the present study as

it stipulates that perceptions of self-determination, competence and affiliation are important determinants of motivation. Also, according to Deci and Ryan, various types of EM exist, some of which are self-determined and may be performed through self-regulation. From lower to higher levels of self-determination, they are: external, introjected, identified and integrated regulation (Figure 1).

FIGURE 1

Representation of the self-determination continuum developed by Deci and Ryan (1985, 1991, 2000)

External regulation corresponds to EM as it generally appears in the literature. That is, behavior is regulated through external means such as rewards and constraints. With introjected regulation, the individuals begin to internalize the reasons for their actions. However, this form of internalization, while internal to the person, is not truly self-determined since it is limited to the internalization of past external contingencies (Vallerand, Blais, Brière & Pelletier, 1989). To the extent that the behavior becomes valued by the individual, and especially that it is perceived as chosen by the individual himself, then the internalization of extrinsic motives becomes regulated through identified regulation. The most self-determined form of EM is referred to as integrated regulation. According to Deci and Ryan (1991), integrated regulation occurs when the individual's action is perceived as personally valued and freely done. However, it appears that this type of motivation is difficult to assess in an educational context (Vallerand, 1993).

An increasing amount of research has been undertaken to evaluate Deci and Ryan's EM formulation. The results consistently support the basic premises of the formulation.

For instance, results from confirmatory factor analyses on the motivation scales have supported the presence of three types of EM in education (Ryan & Connell, 1989; Vallerand et al., 1989).

Along with intrinsic and extrinsic motivation, Deci and Ryan (1985, 1991) have posited that a third type of motivational construct is important to consider in order to fully understand human behavior. This concept is termed amotivation (AMO). Individuals are amotivated when they do not perceive a link between outcomes and their own actions. They are neither intrinsically nor extrinsically motivated. They are non-motivated. Amotivation can be seen in many ways as similar to learned helplessness (Abramson, Seligman & Teasdale, 1978) since amotivated individuals experience feelings of incompetence, and expectancies of uncontrollability.

Justification for and context of experimentation

In the present study, Deci and Ryan's construct has permitted us to assess student motivation in a multidimensional fashion. Their theory goes beyond the usual intrinsic/extrinsic distinction and allows for a more accurate analysis of motivation, thereby opening the door to innovative research. In the theoretical perspective of Ryan and Deci (2000), it seems that a student's academic motivation is modulated by his feelings of self-determination, competence and affiliation, and that what influences these three factors may also have an impact on motivation.

Many researchers, such as Relan (1992), have shown that using virtual learning environments can be a determining factor in promoting feelings of self-determination. Shin's works (1998) suggest that a Web course stimulates students' feelings of competence. As for Christoph, Schoenfeld and Tansky (1998), they have shown that university students registered in a virtual course (n=164) had acquired a significantly greater feeling of self-efficiency than students registered in the same class taught the traditional way (control group, n=231). In their conclusions, these authors also highlight the fact that students registered in the Web course generally felt more competent that their colleagues in the control group.

Are feelings of self-determination, competence and affiliation promoted by Web-based courses? Is the integration of new information technology as a teaching method and as a learning environment likely to sustain the development of greater academic motivation among student teachers? In order to answer these questions, an experimental Web-based course was designed and implemented in a Quebec (Canada) university. As previously mentioned, this was a first at the university, and the context for a study on the impact of a Web course on student academic motivation seemed favorable. We developed the Web-based Introduction to Educational Research course, drawing inspiration from a number of recommendations made by major reports or studies such as those published by the *Higher Education Program and Policy*

Council (2000), Tele-Education New Brunswick (2000), the Institute for Higher Education Policy (2001), the International Distance Education Certification Center (2001). We also included suggestions from Boshier, Mohapi, Moulton, Qayyum, Sadownik and Wilson (1997), one of the first studies on the quality of Web-based courses, analyzing a total of 127 courses according to an encoded grid encompassing 43 criteria.

METHOD

Though studies focusing on the impact of the teaching context on student motivation are quite helpful in pointing out which specific instructional practices could favor student motivation, in general they do not describe how these instructional practices are perceived nor valued by students. In fact, motivation research is a field that has been dominated by measurement, operationalized definitions, variables, hypothesis testing, and statistics. However, we believe that there is room for a research agenda that emphasizes description, and the study of students' understanding and perceptions – an approach to research Erickson (1986) first referred to in education as «qualitative». Though «quantitative» studies are essential to better understand student motivation, it seems obvious that a qualitative look at motivation would greatly complement these types of studies. In particular, a qualitative look at student motivation appears to be useful for new Web-based instruction or learning environments as faculty members and instructors could more easily use research findings to improve their instructional practices. It should, however, to be noted that while qualitative research is interesting for studying the hows and whys of various educational issues, it also has strong limitations, that is a lack of «generalizability» and a not-so-sufficient external validity.

It the present case, it therefore seemed most relevant to conduct a study using both quantitative and qualitative data in order to better understand the impact of a compulsory Web-based course on preservice teachers motivational profile. It was felt that the results would then portray not only how this new teaching context affects preservice teachers motivation, but also how preservice teachers perceive this new Web-based instructional context. The results presented are drawn from both quantitative measures (a motivation scale was administered three times as pre, post and «post post» measurement to all students who were participating in the project) and qualitative measures (semi-structured interviews conducted with preservice teachers after the course [n=40] and transcripts of focus groups held in chat rooms). It appears important to mention that, according to Krathwohl (1998) and Moss (1996), the combination of both qualitative and quantitative data generally allows for a more complete understanding of a research problem. The results that will be presented highlight the way in which a Web-based course –eventually– promotes students' motivation.

Subjects

A total of 429 preservice teachers (331 females and 98 males) enrolled in a four-year teacher education program were selected to participate. Subjects had a mean age of 21 years old.

Quantitative measures and analyses

An adapted version of a motivation scale developed and validated in Canada, the Motivation in Education Scale by Vallerand, Blais, Brière and Pelletier (1989), was administered three times to all students who were participating in the project. The results of the analyses conducted indicate that the internal consistency of all subscales of this scale is excellent, ranging from 73 to 91. With respect to validity, the present results are also very encouraging. A factor analysis highlights the five-factor structure ((1) Amotivation, (2) External regulation, (3) Introjected regulation, (4) Identified regulation, (5) Intrinsic motivation) and thus provides some support for the factorial validity of the scale. The first measure of motivation took place at the beginning of the first class, before the students were fully aware of the technologically enhanced learning environment. The second measure was taken after the third week of the course, when students were more familiar with the particular nature of their learning environment. The third measure was taken just after the twelfth week of the course. A series of single sample paired t-tests procedure was used to measure significance of the difference between the means at T1 and T2, T1 and T3, as well as T2 and T3. The choice of the t-test instead of a repeated measure ANOVA was done since the control of the inequality in time laps between measurements was an important feature under our experimental conditions (Zimmerman & Zumbo, 1993). Moreover, David and Gunnink (1997) highlight that timely unequal pairing of measurement results application should show reasonable robustness.

Qualitative measures and analyses

Drawn not only from the results of the motivation tests, results of this study are the product of the analysis of semi-structured, individual interviews conducted with students at the end of the term, after final marks were posted. Each interview lasted approximately 30 minutes. The results of this study are also a product of the analysis of focus groups held in *chat rooms*. Students were asked to list the advantages of a Web-based course during the interviews and conversations held in chat rooms. As both the interviews and focus groups took place after the course, participation was not compulsory for students. A message was sent to all and the first 40 to agree for an interview were selected. With regard to focus groups held in *chat rooms*, each lasted approximately 60 minutes. It appeared easier to «meet» with students in chat rooms as they did not have to come to university after the semester. There were 216

volunteers who wanted to take part in the focus groups in the *chat rooms*. However, 164 finally took part (some could not anymore, others were working, etc.). As previously mentioned, a total of 24 focus groups in chat rooms were conducted. There were 5 to 10 students in each chat room. The focus groups were conducted in a two-week span.

It appears important to mention here that the qualitative analysis of such data would seem to be an increasingly promising means for dealing with qualitative data in education, especially in light of the teaching methods and the learning environment offered to the students taking «virtual» courses held on the internet (Winiecki, 1999).

Data was analyzed using NVivo 2.0 through a grounded theory approach, or more precisely through a process called ethnographic content analysis (Altheide & Johnson, 1994). This type of content analysis uses many of the traditional content analysis procedures (e.g. Miles & Huberman, 1994), but also the back-and-constant comparison that grounded theory applies (Tesch, 1990). According to Pandit (1996), the three basic elements of grounded theory are concepts, categories and propositions. Concepts are the basic units of analysis since it is from conceptualization of data, and not the raw data collected data per se, that theory is developed. «*Theories can't be built with actual incidents or activities as observed or reported; that is, from "raw data". The incidents, events, happenings are taken as, or analyzed as, potential indicators of phenomena, which are thereby given conceptual labels. If a respondent says to the researcher, "Each day I spread my activities over the morning, resting between shaving and bathing," then the researcher might label this phenomenon as "pacing". As the researcher encounters other incidents, and when after comparison to the first, they appear to resemble the same phenomena, then these, too, can be labelled as "pacing". Only by comparing incidents and naming like phenomena with the same term can the theorist accumulate the basic units for theory*» (Strauss & Corbin, 1990, p. 7).

Categories are the second element of grounded theory. According to Strauss and Corbin (1990), categories are higher in level and more abstract than the concepts they represent and are formed by grouping or integrating concepts. «*Categories… are generated through the same analytic process of making comparisons to highlight similarities and differences that is used to produce lower level concepts. Categories are the "cornerstones" of developing theory. They provide the means by which the theory can be integrated. We can show how the grouping of concepts forms categories by continuing with the example presented above. In addition to the concept of "pacing" the analyst might generate the concepts of "self-medicating" "resting" and "watching one's diet". While coding, the analyst may note that, although these concepts are different in form, they seem to represent activities directed toward a similar process: keeping an illness under control. They could be grouped under a more abstract heading, the category: Self Strategies for Controlling Illness*» (Strauss & Corbin, 1990, p. 7).

Propositions form the third constituent of grounded theory. Propositions highlight generalized interactions between a category and its concepts. Though they were originally termed hypotheses by Glaser and Strauss in 1967, we believe that Whetten's argument for using proposition instead of hypotheses, because grounded theory involves conceptual relationships, whereas hypotheses might entail statistical interactions. Also, as Pandit (1996) argues, since the grounded theory approach produces conceptual and not measured relationships, the proposition is preferred. Some researchers also refer to propositions as «models».

As pointed out by Strauss and Corbin (1990), the development of concepts, categories and finally propositions is an iterative process as grounded theory, compared for example with logistic regression models, is not established and subsequently tested: «*…inductively derived from the study of the phenomenon it represents. That is, discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon. Therefore, data collection, analysis, and theory should stand in reciprocal relationship with each other. One does not begin with a theory, then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge*» (Strauss & Corbin, 1990, p. 23). Within this general qualitative analysis framework, data analysis for all the data collected involved generating concepts through the process of coding which «*represents the operations by which data are broken down, conceptualised, and put back together in new ways. It is the central process by which theories are built from data*» (Strauss & Corbin, 1990, p. 57).

Our coding of all the data (transcripts of interviews, transcripts of focus groups held in *chat rooms*) consisted of three phases: induction (reading all the data so that concepts or codes could emerge), deduction (we coded all the data and had to label each segment) and verification (all coded data was verified). We first opted for an analytical induction technique (e.g. Strauss & Corbin, 1990) to derive coding concepts from the data. Finally, the reiterative verification of coding enabled further adjustments and refinements to the concepts. The process was continued until we reached a point where no additional coding of the data contravened the refined concepts. All these steps for coding all the data was greatly facilitated by the use of NVivo 2.0. which substantially simplified the data analysis process.

PRESENTATION AND ANALYSIS OF RESULTS
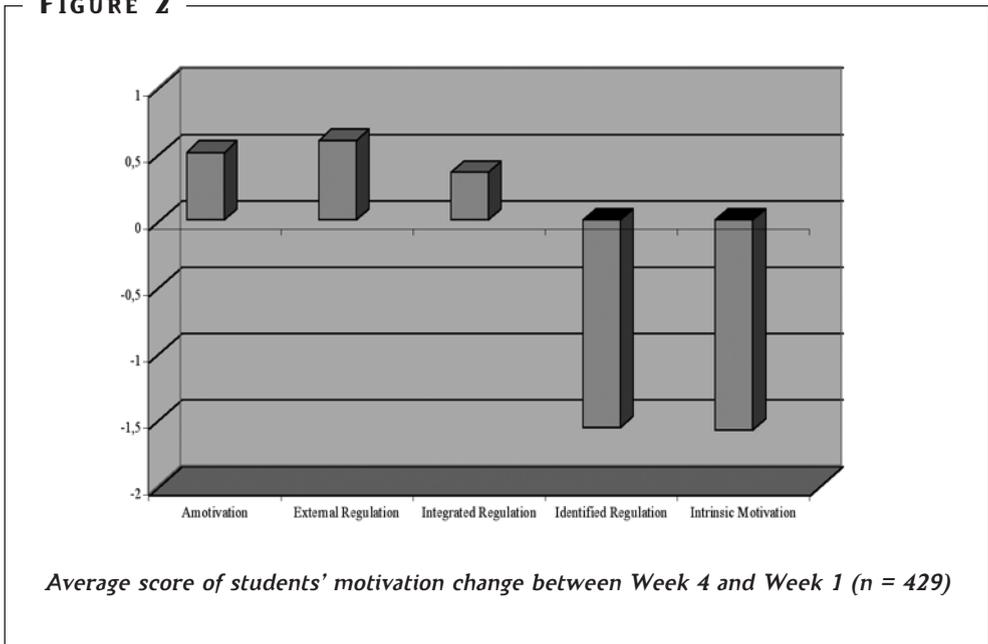
Quantitative measures

As shown in Table 1 and Figure 2, the students' average score for self-determined types of motivation on the second motivation test, at a time when they were completely aware of the organization of the Web-based course, is significantly lower than the average score obtained in the first motivation test ($p < 0,0001$). As well, the

students' average score for non self-determined types of motivation is significantly higher than the one on the first motivation test.

TABLE 1. *Average score of students' motivation change between Week 4 and Week 1 (n = 429)*

	Non or little self-determined types of motivation		Self-determined types of motivation	
	Amotivation	(EM) External Regulation	(EM) Introjected Regulation	(EM) Identified Intrinsic	Intrinsic Motivation
Motivation change (Week 4 – Week 1)	+ 0.51	+ 0.60	+ 0.36	- 1.56	-1.58
Significance of gain (between Week1 and 4)	t = 5.11	t = 6.87	t = 8.01	t = 15.76	t = 20.58
	p < 0,0001	p < 0,0001	p < 0,0001	p < 0,0001	p < 0,0001

FIGURE 2

Average score of students' motivation change between Week 4 and Week 1 (n = 429)
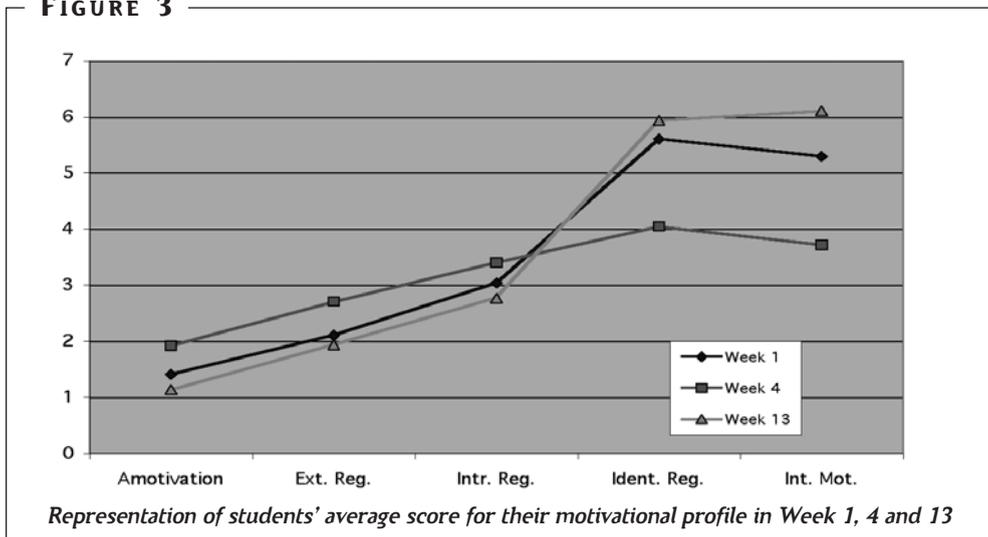
As shown in Table 2 and Figure 3, the average score obtained by the students in the third motivation test, administered just after the twelfth week of the course, highlights a significant increase in self-determined types of motivation, when compared to the average score on both test 1 (week 1) and test 2 (week 3-4). As well, the results highlight a significant decrease in non self-determined types of motivation, also when compared to the average score on tests 1 and 2.

TABLE **2.** *Average score of students' motivational profile for week 1, 4 and 13*

	Non or little self-determined types of motivation			Self-determined types of motivation	
	Amotivation	(EM) External Regulation	(EM) Introjected Regulation	(EM) Identified Intrinsic	Intrinsic Motivation
Week 1	1.41	2.11	3.04	5.61	5.30
Week 4	1.92	2.71	3.40	4.05	3.72
Week 13	1.14	1.94	2.77	5.94	6.11
Sig. of gain (Week 1 vs 4)	t = 5.11 p < 0,0001	t = 6.87 p < 0,0001	t = 8.01 p < 0,0001	t = 15.76 p < 0,0001	t = 20.58 p < 0,0001
Sig. of gain (Week 1 vs 13)	t = 6,28 p < 0,0001	t = 4,77 p < 0,001	t=4.99 p < 0,0001	t= 7,08 p < 0,0001	t = 13.99 p < 0,0001
Sig. of gain (Week 4 vs 14)	t = 15.57 p < 0,0001	t = 17.02 p < 0,0001	t = 15.42 p < 0,0001	t = 21.90 p < 0,0001	t = 29.11 p < 0,0001

FIGURE **3**

Representation of students' average score for their motivational profile in Week 1, 4 and 13

The students' results on the motivation tests seem to highlight the resistance felt and hardships encountered at the beginning of the implementation of the course held on the Web. Nonetheless, these results also show that the motivation of students at the end of the course was much higher than when the course first began or in the second week when a certain effort was required simply to get adjusted to this new kind of «Web-based university teaching».

Qualitative measures

After reading all of the data collected (transcripts of interviews, transcripts of focus groups held in *chat rooms*) various concepts emerged. We then tested out these concepts by coding all the data. Finally, another group of research assistants, familiar with our research topic, proceeded to test out the first coding of all the data by coding it again. This process is called «constant comparison» by Glaser by Strauss (1967) was put in place to verify all codes. The reiterative verification of coding enabled us to further adjustments and refinements of both the concepts and the segments coded. As previously mentioned, we used NVivo 2.0 to code all the qualitative data. All 40 interviews and 24 focus groups (in *chat rooms*) were coded. An average of 172,3 segments were code for each interview, whereas an average of 105,5 were coded for each focus group. Both for interviews and focus groups, many of the segments coded contained more than one code. With the interviews, 89,3 % of the segments coded were grouped into concepts. For the focus groups, 90,2 % of all segments coded were grouped into concepts. Table 3 presents the list of all concepts used to code the data, as well as a quantification of the data coded.

T ABLE 3. *List and quantification of concepts used to code the data*

Concept	Interviews* (n = 40)	Focus groups** (n = 24)	Total
A permanently accessible classroom	604	129	733
Acquire methodological skills.	33	23	56
Actively participate	148	139	287
Autonomy	553	110	663
Choose their workplace	598	144	742
Constant contact with peers (network)	355	130	485
Develop intellectual abilities	21	17	38
Facilitated the learning process	11	14	25
Feel more competent about the topic of the course	67	51	118

Frequent feedback from peers	176	124	300
Interest (motivation)	649	104	753
Knowledge acquisition	49	35	84
Made the topic of the course more accessible to future teachers.	45	38	83
Making choices	173	112	285
Opportunities to communicate with peers	697	183	880
Opportunities to communicate with the professor.	593	202	795
Opportunities to communicate with the technical support team	431	184	615
Personal satisfaction	119	112	231
Structure and manage their knowledge acquisition	52	24	76
Support system	17	15	32
Takes learners' previous knowledge into consideration.	19	18	37
Valorization	339	182	521
Work at their own pace	408	192	600
Total of segments coded for all the concepts	**6157**	**2282**	**8439**
Total of segments coded from all the data***	**6893**	**2531**	**9424**

* An average of 172,3 segments were code for each interview. Some segments contained more than one code.

** An average of 105,5 segments were code for each focus group. Some segments contained more than one code.

*** Concepts which contained less than 10 segments coded were discarded if they remained after the reiteration verification process. That is why there is a difference in this table between the total of segments coded and the total number of segments code for each of the concepts presented. With the interviews, 89,3 % of the segments coded were grouped into concepts. For the focus groups, 90,2 % of all segments coded were grouped into concepts. Table 3 presents the list of all concepts used to code the data, as well as a quantification of the data coded.

We then decided to group concepts into categories, the second element of grounded theory. Though there are various ways to group concepts into categories (e.g. Miles and Huberman, 1994), three researchers individually grouped concepts into categories and then met to compare their results. This, again, could be called a reiterative verification of grouping which enabled further adjustments and refinements to the categories. Table 4 presents the final categories which emerged from the concepts. It is therefore in reference to these categories that the results are presented afterwards.

TABLE 4. *List and quantification of concepts used to code the data (final categories)*

Concept	Interviews* (n = 40)	Focus groups** (n = 24)	Total
Feelings of self-determination	2603	901	3504
Feelings of affiliation	2269	838	3107
Feelings of competence	703	490	1193
Interest	649	104	753

How does the course promote self-determination?

Analysis of the data from this study demonstrates the many ways in which the Web-based course impacted this determinant of student motivation. According to the concepts which emerged from the analysis, and in line with various other studies (e.g. Schacter, 1999) such a learning environment seems to have allowed students to:

- Choose their workplace;
- Work at their own pace;
- Actively participate in their learning by making their own choices;
- Structure and manage their knowledge acquisition;
- Feel more competent about the topic of the course.

A permanently accessible classroom

The comment which is most often found in the data is that the classroom (the class Web site) is accessible at all times and from anywhere. It is among the elements which seem to have been most appreciated by students. Many underscore the advantage of such accessibility and indicate that the flexibility of the learning context helped them to commit themselves fully to their academic program and future career.

> «A class like this has allowed me to appreciate university anew. I work part-time…, but I've always given priority to my studies… This class gave me a lot of flexibility» (interview excerpt; student).

> «Sir …I'm writing to tell you how much I appreciate the Internet class. Having access to the classroom 24 hours a day is a great advantage for me. I find it really modern and it really motivates me to apply myself in my work…» (student chat room excerpt).

Also, for many students living in outlying regions, this class has allowed for greater

autonomy, which has in turn promoted an increase in the time spent on study. Students no longer have to travel to get to class as the latter is accessible from any location.

> «This class also allowed me to give more time to my studies. Driving from home [about 75 km] takes up two hours a day. With this Web course, I could be at school and at home at once» (interview excerpt; student).

> «…usually, I live with my aunt during the week and I go back home on the weekend [about 300 km from the university]. […] No matter where I am, I can do my homework and follow the class. It's very handy for me, it lets me be independent and I waste less time… That way, I spend more time on schoolwork» (interview excerpt; student).

Learning at one's pace: reinforcing feelings of self-determination

This course seems to contribute to the development of students' feelings of self-determination, as they are neither hurried by faster students nor held back by slower students. They can thus progress at their own rate – though there are some deadlines –, independently, within exercises and activities which promote learning. This fact is particularly important when this type of course is compared with traditional courses given in classrooms. The individualized pace afforded by a virtual course appears to be an important motivational factor and seems to be perceived as an advantage by all the students.

> «Hello, it's the end of the class and you wanted some comments... Here are mine… In general, I really enjoyed the course. There was a lot of work, that's true. But, for the first time in a while, I was really able to learn at my own pace. This was the most positive aspect of the class for me. In regular classes, I drift off a lot. Sometimes, it's because I don't understand and the prof goes too fast, other times it's because I'm bored and the prof asks too many easy questions. With an on-line course, I could go at my own pace, and for me, this was a great source of motivation…» (student chat room excerpt).

> «The idea of being able to go at your own pace, I think it's great. In the past, I've dropped out of university classes because the prof went too fast. At the beginning of each course, the very first class, that's what I'm afraid of. If it's going too fast and I don't know anyone, I immediately feel like dropping out. With the Web course, I worked a lot, but I never felt hurried. I could take my time… the time I need to do the work…» (interview excerpt; student).

Self-management of learning and knowledge: a pedagogical environment that opens the door to autonomy and active participation

The design of the virtual course is centered on the development of students' feelings of self-determination (Deci & Ryan, 1991), from the standpoint of both deadlines and personal investments required from students. Indeed, once on the course site, students plans his learning process by using the class calendar. Globally, this calendar allow them to set goals and deadlines of their own while adjusting the pace at which they which to work. Conversely, students enrolled in a traditional course – in a real classroom – have the same constraints and deadlines as their colleagues imposed upon them, usually leaving little room for autonomy.

The analyses of the data conducted reveals that the nature of the course does not promote autonomy unilaterally: the learning method proposed to students requires self-determination and self-management, while emphasizing the development of the student's sense of competence. Moreover, for a few students, the autonomy granted to them at the beginning of the course seemed difficult to manage, particularly during the first few weeks when they thought that in the absence of a real classroom framework and a regular class schedule where one must be present weekly, that «*the work can be done at the last minute*» (student). Some students then stated that they were not «*used to learning by themselves*» (student) or that they may not have been ready to work in a class where «*you have to be the one to discipline a student (me) who doesn't work….*» (student).

However, even if many students weren't used to managing their own knowledge acquisition, many indicated at the end of the term that this was one of the course's positive aspects. Others even stated that having more responsibility pushed them to work harder and participate actively and that it allowed them «*to learn how to learn*» (student).

> «…at the beginning, I wasn't used to disciplining myself. But after a few weeks, I thought it was really good. It was the first time in a long while that I felt responsible for what I was learning» (interview excerpt; student).

> «…I enjoy the course structure. Besides learning educational research methods and how to use new information technology (and this wasn't easy, believe me), we learn a work method. While at first I found the practical exercises really hard […]. It's just that usually, […] we have a sense of being more rigidly followed and directed. Not that we're not in the Internet course, it's just that we have more autonomy in this class. […] Here, it's like were being pushed to learn by ourselves. At first, it's not easy, but in the end you like it (and I'm not just speaking for myself). Finally, I think that it's very good…» (student chat room excerpt).

«…what was interesting in this class was that we could work when we wanted and at our own pace…It's as if we had a lot more freedom. At first, I thought that I wouldn't have to work and that this would be an easy class… And then, we were surprised to see how hard we worked and that sometimes, we even did more than what was asked, as in the gathering of data… and we practically finished the whole course in less than two weeks, except for the research project… Having more autonomy was better for us. We worked really hard and we enjoyed it» (interview excerpt, student).

How does the course promote feelings of competence?

Our study also reveals that the Web-based course put in place helped students build intellectual abilities and acquire methodological skills. In fact, the on-line course *Introduction to Educational Research* put forward a project-based approach centered on knowledge acquisition. For example, by the end of the term, all preservice teachers were required to develop and put in place a small scale research project in a school setting. We chose this approach as it was most likely to promote the acquisition of theoretical and methodological knowledge, as well as to favor the acquisition of a rigorous scientific epistemology. These are crucial for the student who wishes to bring his scientific research project to fruition, this project being the culmination, the result and product of his work and learning.

In order to execute their research project in a school setting, students acquire the basic methodology which allows them to continue to learn and they experience the motivation to bring it to completion. Through this experience, students significantly integrate methodological skills which will prove indispensable in their professional practice and which will contribute to their feelings of competence.

In addition to getting to know the school setting where the research was executed, the completion of the research project gives the students practical and methodological skills, as well as a deep valorization of his approach. The ensuing motivation and great personal satisfaction felt can only promote, beyond the development of scientific rigor and an appreciation for active research and continuing education, students' feelings of competence and self-determination.

The collected data also highlights the role of project-centered approaches (one used in the Web-based course) in the promotion of the students' feelings of competence. Indeed, many students appreciate that the way in which the course and its activities were organized facilitated the learning process, and that the approach takes learners' previous knowledge into consideration. As well, for many, the course demystified educational research and made it more accessible to future teachers.

«…what I liked about the course was that I started from what I already knew.

When I read the objectives and the summary, I'd tell myself 'I know this, I don't know that'. That way, I knew what to expect… It was easier to learn… It was also easier to be interested… But what I liked best, I think, was that I got to do a small-scale research at a school. I had the feeling that the principal from whom I had asked for authorization no longer saw me as just an intern… Also, the principal wants me to present the results at the next teacher's meeting…. I'm giving teachers a presentation and haven't even finished my degree…» (interview excerpt; student).

How does the course promote feelings of affiliation?

It might be easy to think that an on-line course is impersonal and that students will feel removed and distanced from their virtual peers in the class. This was what most of our faculty members expected. Nevertheless, in our experiment, the opposite was observed. Through a range o electronic communication means (email, electronic discussion groups, forums, chat rooms), students always had opportunities to communicate with peers, the technical support team and the professor. While students develop personal autonomy for their work and research methods, they are not isolated as they can also count on feedback from their peers. Indeed, this course was designed to promote an optimal exchange of ideas and information, the confrontation of opinions and viewpoints and the creation of a support system, something which is not always possible in traditional classes. Through a wide array of means of communication, the availability of resource persons to answer students' questions is, in a way, increased.

The qualitative analyses just presented seem to highlight the way in which a distance education course given on the Web eventually assists in the development of the students' motivation to learn. Through such a course, the students and the professor were required to think differently of their relation with time and space and they were challenged to make this new approach to teaching and learning their own.

Finally, we were able to form propositions which highlight some interactions between the various categories and concepts (Figure 3). The results of the students in the three motivation tests were corroborated by the qualitative analyses. The analysis of the interviews conducted with the students (n = 40), the transcripts of focus groups held in *chat* rooms (n=24) also highlight the way in which a Web-based course promotes the students' motivation, and in particular the determinants of motivation (e.g. Deci & Ryan, 2000).

CONCLUSION

We believe that our study can be considered as a welcomed addition to the role and value of integrating ICTs in teacher education programs. Our results could also help

teacher educators innovate in their teacher training programs by providing them with insight into one effective way (Web-based course) to prepare future teachers to use ICTs for teaching and learning.

While the analysis of the results reveal the positive impact of a Web-based course on students' motivation to learn, the analyses conducted also unveil the fact that all students may not be ready to handle such autonomy or self-determination, and that the gap between the university classroom and the virtual classroom is substantial, possibly difficult to bridge without adequate preparation. This gap is particularly evident when we observe the significant decrease in the students' motivation after only four weeks of the course.

However, despite the obstacles students faced, analysis of the interviews and *chat rooms* focus groups exposes the advantage of integrating Web-based courses in teacher education programs. The pilot-project experienced in Canada has enabled us to note the change which occurs among future teachers when they are confronted with information and communication technologies (ICTs) in their practical training: a change in terms of their motivation to learn. The experience they underwent as learners, when they were faced in a compulsory situation with the integration of technologies in the context of a university course (*Introduction to Educational Research*), is likely to shed a positive light on the integration of ICTs in general in teacher education programs. In addition, it may, quite possibly, create favorable conditions and incentive for further integration of ICTs in their own teaching, either during a practicum (field practice) or during their professional teaching endeavors. Technologies are then perceived as learning tools with which the learners become more autonomous, more analytical in the face of dilemmas.

The integration of new information and communications technologies in higher education, and more precisely in teacher education programs presents an enormous challenge and the disruptions inevitably entailed must be faced with both dynamism and caution. Preservice teachers confronted with the integration of technologies in their learning were called upon to view differently their relation to time and space; they had to acquire a new way of learning which seemingly provided them with increased motivation. However, integrating new information technologies in university pedagogy represents an enormous challenge and the disturbances that will inevitably follow must be met with both enthusiasm and wariness. The pilot-project implemented in Quebec have allowed us to ascertain that there are substantial advantages in integrating Web-based courses in teacher education programs, although there remains a large and considerable gap between the «real» university classroom and the virtual, technology-enhanced university classroom.

Further research into the impact of Web-based courses on the actual use of ICTs by preservice teachers during their field practice would be required. Does learning

with ICTs via Web-based courses during teacher education training programs make a difference in the elementary or secondary-school classroom? Finding answers to such a question could definitely provide valuable insight into the effectiveness integrating ICTs into teacher education programs. It could also provide suggestions into effective ways to prepare future teachers to use technology.

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REFERENCES

Abramson, L. Y., Seligman, M. E. P. & Teasdale, J. D. (1978). Learned helplessness in humans: critique and reformulation. *Journal of Abnormal Psychology*, 87, 49-74.

Altheide D. L. & Johnson, J. M. (1994). Criteria for assessing interpretive validity in qualitative research. In N. K. Denzin & Y. S. Lincoln (eds) *Handbook of qualitative methodology* (Thousand Oaks CA: Sage), 485-499.

Boggiano, A. K., & Pittman, T. S. (1992). Divergent approaches to the study of motivation and achievement: the central role of extrinsic/intrinsic orientations. In A. K. Boggiano & T. S. Pittman (eds) *Achievement and motivation: a social–developmental perspective* (New York: Cambridge University Press), 268-276.

Boshier, R., Mohapi, M., Moulton, G., Qayyum, A., Sadownik, L. & Wilson, M. (1997). Best and worst dressed web courses: Strutting into the 21st century in comfort and style. *Distance Education - An International Journal*, 18(2), 36-49.

Bowen, C. E. & Madsen, C. H. (1978). Teaching style: a primary determinant of student motivation. *Boston University Journal of Education*, 160(4), 16-24.

Bullock, D. (2004). Moving from theory to practice: an examination of the factors that preservice teachers encounter as the attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education*, 12(2), 211-237.

Christoph, R., Schoenfeld, G. A. & Tansky, J. W. (1998). Overcoming barriers to training utilizing technology: the influence of self-efficacy factors on multimedia-based training receptiveness. *Human Resource Development Quarterly*, 9(1), 25-38.

David, H. A. & Gunnink, J. L. (1997). The paired t-test under artifical pairing. *American Statistician*, 51(1), 9-12.

De Charms, R. C. (1968). *Personal causation: the internal affective determinants of behavior* (New York: Academic Press).

Deci, E. L. (1975). *Intrinsic Motivation* (New York: Plenum).

Deci, E. L. & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior* (New York: Plenum).

Deci, E. L. & Ryan, R. M. (1991). A motivational approach to self: integration in personality. In R. A. Dientsbier (ed.) *Perspectives on motivation: Nebraska symposium on motivation* (Lincoln: University of Nebraska Press), 237-288.

Deci, E. L. & Ryan, R. M. (2000). The «what» and «why» of goal pursuits: human needs and the self-determination of behaviour. *Psychological Inquiry*, 11, 227-268.

Eggen, P. & Kauchak, D. (1994). *Educational Psychology: classroom connections* (New York: Macmillan College Publishing Company).

Erickson, F. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (ed.) *Handbook of research on teaching* (New York: Macmillan).

Glaser, B. & Strauss A. (1967). *The Discovery of Grounded Theory* (Chicago: Aldine).

Grégoire, R., Bracewell, R. & Laferrière, T. (1996). *L'apport des nouvelles technologies de l'information et de la communication à l'apprentissage des élèves du primaire et du secondaire* (Ottawa: Rescol/Schoolnet).

Higher Education Program and Policy Council (2000). *Distance Education: guidelines for good practice* (Washington DC: HEPPC).

Institute for Higher Education Policy (2001). *Quality on the line: Benchmarks for success in Internet-based Distance Education* (Washington DC: IHEP).

International Distance Education Certification Center (2001). *Distance Education standards: principles for designing and delivering quality Distance Education Courses* (Washington DC: IDEC).

Krathwohl, D. R. (1998). *Methods of educational and social science research: an integrated approach* (New-York: Longman).

Mc Combs, B. L. & Pope, J. E. (1994). *Motivating hard to reach students* (Washington DC: APA).

Meece, J. L. (1993). The will to learn. *Educational Researcher*, 22(2), 35-36.

Miles, M. & Huberman, A. (1994). *Qualitative Data Analysis* (Thousand Oaks CA: Sage).

Moss, P. A. (1996). Enlarging the dialogue in educational measurement: Voices from interpretive research traditions. *Educational Researcher*, 25(1), 20-28.

Moursund, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education (Research Study)* (Santa Monica CA: Milken Family Foundation).

Overton, W. F. (1984). World views and their influence on psychological theory and research: Kuhn-Lakatos-Laudan. In H. W. Reese (ed.) *Advances in child development and behavior* (Orlando FL: Academic Press), 18, 191-226.

Pandit, M. R. (1996). The creation of theory: a recent application of the Grounded Theory Method. *The Qualitative Report*, 2(4). http://www.nova.edu/ssss/QR/QR2-4/pandit.html [30.1.2007].

Pintrich, P. R. & Schunk, D. H. (1996). *Motivation in Education* (Englewood Cliffs NJ: Prentice-Hall).

Relan, A. (1992). Strategies in Computer-Based Instruction: Some Lessons from Theories and Models of Motivation. In *Proceedings of Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology*. (Washington DC: Association for Educational Communications and Technology: Research and Theory Division), 1, 613-624.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist*, 55 (1), 68-78.

Ryan, R. M. & Connell, J. P. (1989). Perceived locus of causality and internalization: examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, 57(5), 746-761.

Schacter, J. (1999). *The Impact of Education Technology on Student Achievement. What the Most current Research Has to Say* (San Francisco: Milken Exchange).

Shin, M. (1998). Promoting students' self regulation ability: Guidelines for instructional design. *Educational Technology*, 38(1), 38-44.

Slavin, R. E. (2004). Education research can and must address «what works» questions. *Educational Researcher,* 33(1), 27-28.

Stipek, D. J. (1988). *Motivation to learn: from theory to practice* (Englewood Cliffs NJ: Prentice-Hall).

Strauss, A. & Corbin, J. (1990). *Basics of qualitative research. Grounded Theory procedures and techniques* (London: Sage).

Tele-Education New-Brunswick. (2000). *The design, development and delivery of internet based training and education* (New-Brunswick: Tele-Education NB).

Tesch, R. (1990). *Qualitative research: analysis types and software tools* (London: Falmer Press).

U. S. Congress, O.T.A. (1995). *Teachers and technology: making the connection (Report OTA-HER-616)* (Washington DC: US Congress, Office of Technology Assessment).

Urugoglu, M. E. & Walbert, H. J. (1979). Motivation and achievement: a quantitative synthesis. *American Educational Research Journal*, 16, 375-389.

Vallerand, R. J. (1993). La motivation intrinsèque et extrinsèque en contexte naturel: implications pour les secteurs de l'éducation, du travail, des relations interpersonnelles et des loisirs. In R. J. Vallerand & E. E. Thill (éds) *Introduction à la psychologie de la motivation* (Montréal: Éditions Études Vivantes-Vigot), 533-581.

Vallerand, R. J. & Sénécal, C. B. (1993). Une analyse motivationnelle de l'abandon des études. *Apprentissage et Socialisation*, 15(1), 49-62.

Vallerand, R. J., Blais, M., Brière, N. & Pelletier, L. (1989). Construction et validation de l'échelle de motivation en éducation. *Revue Canadienne des Sciences du Comportement*, 21, 323-349.

Waxman, H. C. & Walberg, H. J. (eds.) (1991). *Effective teaching: current research* (Berkeley CA: Mc Cutchan Publishing Corporation).

Weiner, B. (1992). *Human Motivation* (New York: Springer Verlag).

Winiecki, D. (1999). *Studying conversation in the asynchronous computer-mediated classroom: Conversation analysis in the 21st century*. Paper presented at the First International, Interdisciplinary Conference: Advances in Qualitative Methods, Edmonton, Alberta, Canada, 18-20 February.

Zhao, Y. & Frank, K. A. (2003). Factors affecting technology uses in schools: an ecological perspective. *American Educational Research Journal*, 40(4), 807-840.

Zimmerman, D. W. & Zumbo, B. D. (1993). Relative power of the Wilcoxon test, the Friedman test and repeated measures ANOVA on ranks. *Journal of Experimental Education*, 62(1), 75-86.