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The Impact on Writing Skills of Tablets in College Developmental English Classes

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Abstract

Incoming students at Seneca College and at most other community colleges in Ontario undergo a post-admission English language skills assessment. The assessment is used to diagnose their writing needs and to place them into a course appropriate to their level of proficiency.

Over the past five years, an increasing number of incoming students at Seneca have been placed into a developmental English course called EAC149 (in 2005, 38.0 per cent; in 2009, 43.4). EAC149 is a four-hour-per-week, non-credit reading and writing course designed to prepare students for college-level English.

While developmental or remedial classes are not necessarily associated with lower academic success (Attewell, Lavin, Domina & Levey, 2006), our records indicate that a lower success rate in EAC149 puts students at a pronounced risk of not graduating from Seneca College. Effective methods to encourage successful completion of EAC149 may thus increase students' chances of graduating from their programs.

This project assessed the impact of tablet technology and DyKnow interactive software on the development of students' writing skills in EAC149. Tablets enable individuals to use a pen-like instrument called a stylus to take notes, record marginal comments and modify digital text in a manner similar to writing with a pen on paper. DyKnow interactive software enables teachers to share and record digital content and collaborate with students individually and collectively as a classroom session proceeds. With each tablet linked to DyKnow interactive software, a teacher can display the work of individual students anonymously on a screen for viewing by all class members and incorporate notations and marginal comments as they discuss the text.

This research project extended over three semesters, with the same EAC149 course offered in each semester. Approximately 300 students were randomly assigned to either an experimental group, which used tablet computers and DyKnow software, or a control group. Two professors each taught one control-group class and one experimental-group class per semester.

Our findings suggest that tablet technology and DyKnow interactive software had a measurable impact on students' attendance, participation and performance in EAC149, and that students in the experimental groups reached higher levels of engagement and achievement throughout their course than participants in the control group.

While the findings were not conclusive, they suggest that further research should be conducted to assess in greater detail the impact of this technology on the success rate of remedial English programs. Fifty-seven students using the technology earned passing grades on their final exams in EAC149 compared to 46 students in the control group. Of 11 students who responded to a survey conducted after the program ended, eight said they paid more attention in class and that tablets improved their classroom participation.

Introduction

Since Seneca College opened its doors in 1967, it has required all students to pass a first-semester English writing course. Since 1971, this course has been referred to as College English (EAC150).

The content of EAC150 addresses the basic communication needs of Ontarians in the workforce. In the context of Seneca's 282 full-time and part-time educational programs, students who pass through the gateway of EAC150 have acquired the necessary skills to study more specialized types of writing for research, business and technical applications. They also have the necessary grounding in written English communications to take postsecondary courses at Seneca in a variety of subjects, from business to graphic arts, from aviation technology to child development.

The population that Seneca College serves is very diverse, and by the 1990s, many students arrived at the College needing more guidance than EAC150 was designed to offer. Although most of these students had recently graduated from Ontario high schools, they had not acquired the rudiments of sentence structure or ordering paragraphs. They could not read a newspaper article or short essay and summarize what they had just read. Their reading skills were insufficient, and they could not meet the basic standards of analytical, critical and research-based writing required to begin EAC150.

To respond to this challenge, the college put two initiatives in place. First, it required all incoming students to undergo a test to measure their skills in written English. Second, the college created a non-credit, developmental writing course, called English and Communication (EAC149), in which first-year students could acquire the skills they needed to enter EAC150 with some confidence that they could pass the course. The first instance of EAC149 was in 1991.

The number of students assigned to EAC149 has risen steadily. In the year before this study began, more than 50 per cent of all full-time students at Seneca College were placed in EAC149. This has serious implications for students and for Seneca College. Records show that an inability to succeed in EAC149 puts a student at risk of not graduating.

Considering the increasing proportion of students who require developmental English instruction when they enter a college program, any technique or initiative that raises their rate of success should be explored. Tablet technology appears to provide one promising approach.

We began our project on the assumption that tablets and DyKnow interactive software would create a dynamic classroom environment. We used tools and methods that had been applied in a previous assessment of tablet technology in Developmental Mathematics and Science at Seneca College (Carruthers, 2010). That study extended over six semesters and involved approximately 160 students. It indicated that marginalized students could increase their retention and enhance their chances of success if their course was conducted in a student-centred, interactive, tablet PC environment. Our research design, tools, and analysis were informed by knowledge gained from that study.

We began our study believing that the capacity of tablet technology and DyKnow interactive software could have a similar impact on students in a developmental English course. Using tablets communicating through DyKnow software, students can collectively revise and shape their written assignments. They can share and then submit their work for evaluation electronically. Students and teachers can use the technology to edit each student's work and provide immediate feedback. Using this technology, a teacher and student can work together privately to add content and refine ideas in a text visible on the tablet only to each other. Students' work can also be displayed anonymously and discussed by the entire class. A student's writing can be compared to exemplars, providing the student with benchmarks for assessing the qualities of good writing.

Considering the scope of the software's capabilities, we wanted to see if this technology could help more students to complete successfully their developmental English course, so that more students could eventually graduate from their chosen programs.

In the following sections, we discuss the results of our study and its implications for addressing the challenges of developmental English programs at the college level.

Literature Review

Developmental education in community colleges presents a formidable challenge. At Seneca College and other community colleges in Ontario, students who do not succeed in completing their developmental education courses after repeated attempts often drop out of their programs before they graduate.

As Gonzalez (2012) observes, “A major stumbling block for community-college students is remedial education. Many students languish in those reading, writing, or math classes and eventually drop out, curtailing their transfer or graduation plans. The problem is especially acute among minorities and low-income students.”

Strategies to enhance student success in developmental reading and writing programs include accelerated learning programs (Roberts, 2012), the creation of learning communities (Richburg-Hayes, Lashawn, Visher & Bloom, 2008), increased student-faculty interaction (Peele, 2012), individual counseling and early assessment of high-school students (McClenney, 2009).

Nakamaru (2012) suggests that technology-mediated learning activities do not necessarily lead to increased student engagement. However, his study focused on students in a remedial English-as-a-second-language course who engaged over a single semester with a class wiki outside of the classroom. In another study, technologies such as blogs were shown to have improved academic engagement, critical thinking and reading skills for students involved in developmental education (Atkins, 2008).

The review of the literature indicates that no single strategy will effectively and consistently raise the success rate of developmental English programs. Studies support the idea that a combination of methods such as tablet technology, the creation of learning communities, increased student-faculty interaction and/or individual counseling may have a positive impact on student achievement (McClenney, 2009; Rutschow, Cullinan & Welbeck, 2012).

It is also argued that students must become fluent in writing across different technological modes, from pen and ink to computer to tablet, and that developmental instruction that utilizes tablet technology furthers this objective at the same time as it helps to improve student achievement.

Considering the increasing proportion of students who require developmental English instruction when they enter a community college program, tablet technology appears to be one promising approach to raising their rate of success.

Methodology

This purpose of this study was to document and assess the use of tablet technology and interactive communication software to engage a diverse student population placed in developmental English in order to improve their core writing and reading skills.

Results of this study will provide professors in the School of English and Liberal Studies at Seneca College, as well as faculty at other Ontario colleges, with a primer on using this technology to better serve the needs of the developmental English student population.

a. Context

Incoming students at Seneca College (and at many other Ontario Colleges) undergo a post-admission English skills assessment that is used to diagnose their writing needs and to place them in a course appropriate to their level.

In the past five years, an average of 42.4 per cent of incoming students have tested below the level prescribed for college English studies and have been placed into EAC149, a four-hour-per-week reading and writing course designed to prepare students for college-level English. EAC149 is a non-credit course. To pass the course, students must earn a minimum term grade of 60 per cent and pass the final exam, which is graded either passed or failed.

The number of students assigned to EAC149 has risen steadily since 2005. In the year before this study began, more than 50 per cent of all full-time students were placed in EAC149. Records show that a lower success rate in EAC149 puts a student at risk of not graduating.

This research was grounded in the assumption that tablets and DyKnow interactive software create a dynamic classroom environment. With tablets communicating through DyKnow software, students can collectively revise and shape their written assignments. They can share and then submit their work for evaluation electronically. Students and teachers can use the technology to edit each student's work and provide immediate feedback. The teacher and the student can work together to add content and refine ideas in a text visible on the tablet only to each other. Students' work can be displayed and discussed anonymously in class. The writing can be compared to exemplars, providing students with benchmarks by which they can assess the qualities of good writing.

In a remedial EAC149 class, where interest in the subject matter is low to begin with, the introduction of this kind of engaging technology provides a way of contextualizing the relevance of this discipline to students' lives in a mode that resonated with today's college learner.

The assessment plan used tools and methods that are based on a previous assessment of tablet technology in Developmental Mathematics and Science at Seneca College (Carruthers, 2010). That study extended over six semesters and involved approximately 160 students enrolled in a two-semester bridging program leading to an Applied Science and Technology (AST) Certificate. Students were assigned evenly to an experimental group, using tablet technology and DyKnow interactive software, and a control group, which took notes using pen and paper while attending lectures in a computer lab. That study indicated that a student-centred, interactive tablet PC environment resulted in increased retention and success of marginalized students. Knowledge gained from that study informed our research design, tools, and analysis.

b. Data Collection Instruments

Over three consecutive semesters, this project assessed the impact of the use of tablet technology and DyKnow interactive software on the development of students' writing skills. Through observations and evaluations by students and teachers involved in the project, it generated documentation and best practices that are now available for use by other English faculty, particularly in Ontario colleges.

All students enrolled in the classes that would be used to comprise the experimental and control groups were contacted in advance of the study and invited to participate by signing a consent form. The data were collected by an associate researcher who had no connection to the program.

Attendance was tracked in all classes. Although students were ultimately assessed on a pass/fail basis, teachers graded all assignments, including final exams. These grades were used throughout the project to monitor the impact of tablet technology on student performance.

A web-based survey was used in the study. As soon as the data were collected, they were stripped of identifiers and stored in a database. Only the data management staff could identify the source and identity of the data. Only aggregated data were used for analysis. Teachers did not have access to raw data except for class grades.

Open-ended questions on surveys were used to track students' reaction to tablet-centred learning. Questions on the survey were adapted from a technology-use survey tool applied previously in the math-science tablet project (Carruthers, 2010) and from a standardized engagement survey (Appendices 1 and 2).

To reduce survey fatigue, we conducted one survey session in which the surveys were provided sequentially from a single online link. Based on the experience of previous tablet research, surveys were scheduled in-class at a time of highest attendance. This was done in an effort to maximize survey participation.

Faculty involved in teaching the EAC149 courses also made observations about the impact of tablet technology and related software on their capabilities to engage their students and to guide them through the course curriculum (Appendix 8).

c. Participants

As a way of understanding the context for using tablet technology in a remedial language classroom, it is important to understand who is in the remedial classroom and why.

Over the duration of the project, a total of 303 students were enrolled in the developmental English courses. Each course extended over 13 weeks of the semester, with four hours of class per week. Of the total enrollment, 105 students, or 35 per cent, had already completed one or more semesters of their program (Table 1). These students had failed the course at least once before. The rest (65%) were entering their first semester and were taking EAC149 for the first time.

First-semester students are primarily English-language users below 20 years of age who cannot yet write a convincing 500-word analytical essay. Of the students who had failed the EAC149 at least once, many needed to develop college-level vocabulary, grammar and reading skills. Others needed help with study skills and reasoning ability. Some needed improvement in all these areas.

Table 1 shows the number of students who were assigned to the developmental English program at the beginning of the academic year. Subsequent tables show results of students who actually participated in EAC149. Since motivation is one of the factors involved in completing the course successfully, it is important

to show the proportion of students placed in the EAC149 program who do not bother to show up for the first class. These initial figures show that approximately one-fifth of the students assigned to EAC149 did not attend even the first class. This suggests a wide disparity in motivation among all students assigned to the program and provides a glimpse of the obstacles involved in guiding students successfully to its completion.

Two-hundred-fifty-three students attended one or more classes of EAC149. Of that number, 15 did not complete the 13-week course. Students who decide not to complete the course are not required to give a reason for their decision.

Table 1: Semester Placement of Students Enrolled in EAC149, Winter 2011-Winter 2012

	1st semester	2nd semester or higher
Students	198	105

It is also notable that some sections of EAC149 included a high proportion of students from technology areas (Table 2). Of the 303 students who enrolled in EAC149 over three semesters, 125 (43%) were enrolled in technology-related programs (Table 2). These students may have been more familiar and likely felt more comfortable with tablet technology than students from non-science and non-technology programs.

At the same time as they participated in this project, 20 students from Biochemistry, in the AST program, were participating in another tablet project conducted in their program-related math courses. These students were also more familiar than the others with tablet technology, especially as the semester progressed.

Table 2: Technology Students Enrolled in EAC149, Winter 2011-Winter 2012

Area	Number	Percent of total (%)
Computer Networking (CNS)	18	6
Computer Programmer (CPD)	8	3
Computer Programming & Analysis (CPA)	12	4
Computer Systems Technology (CTY)	14	5
Biotechnology Technologist (BTR)	17	6
Chemical Laboratory Technician (CLT)	12	4
Chemical Engineering Technology (CHY)	10	3
Chemical Laboratory Technology (CLP	14	5
Applied Science & Technology (AST)	20	7
Total	125	43

Over the duration of the project, the experimental group, using tablet computers and DyKnow software, consisted of two class sections per semester for three semesters. The control group also consisted of two class sections per semester for three semesters. Over the three semesters, each of two teachers, Professor A and Professor B, taught one control group class and one experimental group class.

Table 3: Group Treatments and Timeline

Treatment	Semester			
	Fall 2010 Pilot	**Winter 2011 Cohort #1**	**Fall 2011 Cohort#2**	**Winter 2012 Cohort #3**
Experimental (Tablets)	PROF. A	PROF. A	PROF. A	PROF. A
Control (No tablets)	PROF. A	PROF. A	PROF. A	PROF. A
Experimental (Tablets)		PROF. B	PROF. B	PROF. B
Control (No tablets)		PROF. B	PROF. B	PROF. B

Table 4: Enrolment Totals by Semester and Group

Semester	Tablet	Control
Winter 2011	27	25
	26	27
Fall 2011	23	23
	24	26
Winter 2012	28	23
	25	26
Total	**153**	**150**

d. Procedures

The experimental group used tablet laptops, while the control group did not. The sections were samples of convenience influenced by the availability of the tablet classroom and the two teachers.

The experimental class was almost identical in structure to the control class. All content and assessments were similar. The courses differed only in their delivery, which was influenced by the greater capacity of tablet technology and DyKnow software to accommodate departures from standard procedures. Students in the experimental group, for example, worked directly on their tablets, writing notes and sharing their observations with their professor for comments. In this group, professors could use a stylus to deliver written feedback electronically on drafts and revisions. Throughout their assignments, these students could transmit electronic copies of rough drafts of paragraphs or sections of their work to their professor via email and receive handwritten comments within a day. This was not possible in the control groups.

Moreover, teachers in the experimental groups could use DyKnow software to generate classroom discussions, activities and lessons. Teachers could also project lesson panels onto screens in the classroom or directly onto students' tablets. Students could collaborate in their classroom work either by reconfiguring their seating arrangements or by joining online groups that enabled participants to view each other's screens and communicate using a chat function while remaining anonymous. Students could also use the technology to view, compare and annotate each other's work on the same screen. Anonymity enabled students to solicit help without feeling embarrassed about their limitations.

Assignments for control and experimental groups were matched in order to assess content and delivery variables. Tablets were used only when appropriate in curriculum delivery and to facilitate interaction. The entire course was not delivered using tablets.

Since this study examined the impact of using interactive software and tablets on students' writing skills, baseline samples for experimental and control groups were collected from the post-admission skills assessment as a pre-intervention writing sample. The same assignment (using a different reading sample and related writing triggers) was given at the end of the semester as a post-intervention assessment.

In addition, the performance of students in the control and tablet classes was measured using the pre- and post-course writing assessments administered in the first few days of every semester and again at the end of every semester to assess each student's level of English writing proficiency. Performance was also measured according to detailed attendance records maintained by EAC149 teachers to indicate the presence in class of each student at the beginning and end of each session. Students also received marks for their performance on quizzes, essays, research project, mid-term and final exams, which enabled the research team to assess and compare performance in the control and experimental groups.

Formal and informal writing assignments for both control and experimental groups followed the established EAC149 curriculum. There were some differences in execution and feedback between control and experimental groups because of the inherent capabilities provided by the tablet and the DyKnow interactive learning environment. In the experimental group, for example, students had quick access, through their tablets, to the internet for facts, statistics, and applications arising from class discussion.

Finally, we administered a Student Perception of Technology Use survey to students in the experimental group. The survey asked students to assess their experience in EAC149 using tablet technology and DyKnow interactive software (Appendix 1). Unfortunately, of the 129 students who used the technology over three semesters, only 11 responded to the survey, a response rate of slightly less than ten per cent. This was not sufficient to conduct a meaningful analysis.

Findings

The tablet project was conducted over three semesters, in classes led by two experienced professors. In each semester, for each professor, approximately 50 students in EAC149 were assigned to a control group and another 50 students to an experimental group using Hewlett-Packard (HP) tablets. Each group followed the same basic curriculum.

In calculating average marks, we did not include students who did not complete the course.

Results are based on the marks over three semesters of the approximately 250 students who enrolled in and completed EAC149 (Table 4). Marks obtained by students in the experimental group were compared to marks obtained by students in the control group to assess the impact, if any, of tablet technology on improving student achievement.

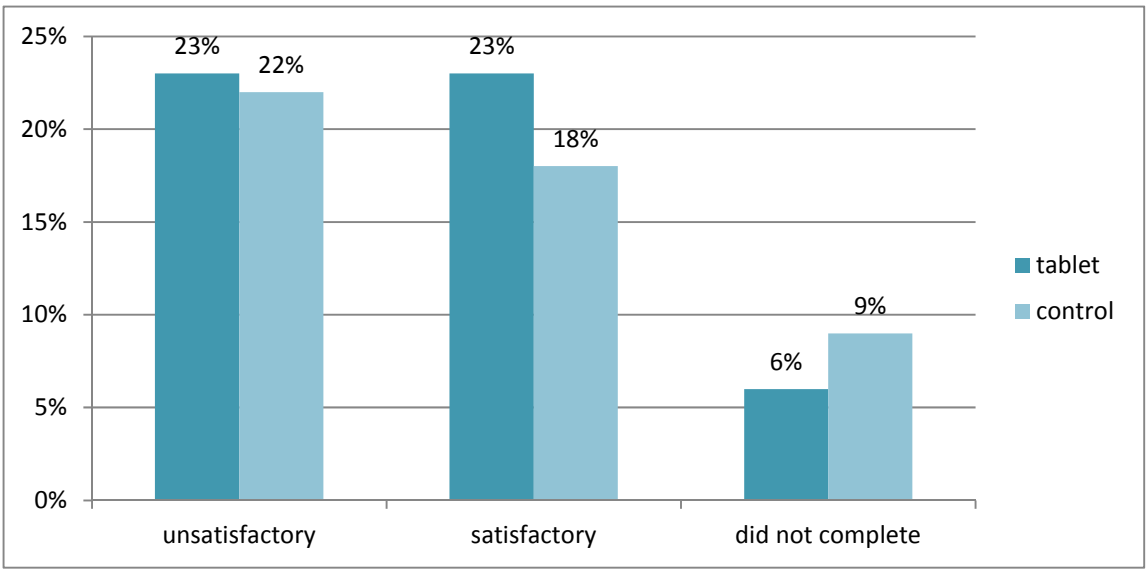
Over the period of the study, differences between the control group and the experimental group were most noticeable in the number of students who passed the course and in the number of students who did not complete the course.

Some of the differences between the two groups can be attributed to the total number of students. There were 124 students (49%) enrolled in the control group compared to 129 (51%) in the tablet group. But even after taking into account the lower number of students in the control group, proportionately fewer students in this group passed the course than students in the tablet group, while more students in the control group did not complete the course.

a. Student Performance

Students who complete EAC149 receive marks for their term work, which accounts for 70 per cent of their assessed performance in the course. Students also receive grades on the final exam, which they have to pass in order to pass the course. Students require a minimum of 60 per cent to pass both the course and the exam.

Table 5: Final Grades



Term marks are based on a number of factors such as reading skills, writing samples and quizzes, and include numeric grades based on several specific assignments. It can be argued that these marks are more indicative of a student's proficiency than are marks based on a final exam alone. While the final exam tests a student's abilities and comprehension of the subject, the other tests and assignments challenge other capabilities involved in essay-writing, such as retention of immediate information and focused research, and they may reflect more clearly the impact of tablet technology on a student's performance.

In fact, based on marks awarded over the term but excluding the final exam in each semester, there was an observable difference in achievement between students using tablet technology and students in the control group (Table 5).

Over three semesters, students using tablet technology achieved an average mark of 50.0 per cent for their term work. Over the same period, students in the control group achieved an average mark of 47.6 per cent for their term work.

Students using tablet technology also achieved higher average marks than the control group for their term work in two of the three semesters. Only in the Winter 2011 semester did the control group out-perform the group using tablet technology, and only by an average mark of 50.4 per cent compared to 49.1 per cent.

Of students who received a passing grade of 60 per cent or higher for their term work, the 44 students in the tablet group achieved an average of 65.2 per cent. In the control group, the 26 passing students achieved an average mark of 64.8 per cent.

Average marks were influenced by extremes in the lowest marks and by higher marks that did not exceed 70 per cent. In one class, for example, six students recorded marks ranging between 13.3 per cent and 35 per cent, while the marks of the highest eight students surpassed 60 per cent but did not exceed 68 per cent.

After writing a final exam, students do not receive a mark for the entire course, but either pass or fail. Of 129 students who participated in courses using tablet technology, a total of 57 (44%) passed the course while 57 students (44%) failed the course. Another 15 students (12%) did not complete the course.

Of the 124 students who participated in the control group, 46 (37%) passed the course, while 56 students (45%) failed the course. Another 22 students (18%) did not complete the course.

Table 6: Average Marks

	Tablet (%)	Control (%)
Winter 2011	49.1	50.4
Fall 2011	48.8	44.3
Winter 2012	51.7	46.4
Overall:	50.0	47.6

b. Attendance

A comparison of attendance records of students enrolled in EAC149 shows that more students attended classes in the experimental group than in the control group (Table 6). Students who attended a class are assumed to have participated in the class. Conversely, students who did not attend a class are assumed not to have participated in the class. Unfortunately, attendance records were incomplete, and our conclusions are based on the examination of records for only six of the 12 groups enrolled in the course over three semesters.

Nevertheless, a difference is evident between the two groups. Comparing the total number of classes attended with the total number of classes missed by students in each group, it appears that students using tablets missed fewer classes and attended more classes than students in the control group. This is apparent even when differences between the total number of students in each group are considered.

When combined with students' observations about their experience with tablets, described in the next section, it becomes increasingly apparent that tablets encourage class participation.

Table 7: Attendance Data

	Tablet	**Control**
All sessions/students		
Total classes missed	79 (9.6%)	102 (13.9%)
Total classes attended	740 (90.3%)	633 (86.1%)
Total students*	61	53
Total incompletes	12	13

*Students who completed the course. Attendance records available for six of 12 groups.

c. Student Evaluations

In a survey of their perceptions of tablet technology and DyKnow interactive software, students in the tablet group were asked to evaluate their experience in EAC149. Unfortunately, they were asked to complete the survey after the semester had ended, and their participation was voluntary. Of the 129 students who used the technology over three semesters, 11 responded to the survey, a response rate of slightly less than ten per cent. While their comments provide some useful indications about the impact of tablet technology on their performance, the response rate is not sufficient to yield statistically significant results.

Of the 11 students who responded, seven agreed or strongly agreed that tablets helped to improve their performance in the course. Eight students also agreed that tablet technology improved their participation in the course. (The remaining students were neutral in their assessments.)

All respondents agreed that having tablets in class improved their learning experience compared to other English courses that they had taken, and nine students said that the tablet helped them to understand the course material better.

The survey categories and responses are compiled in Appendix 8.

d. Student Comments

In the same survey, students were invited to comment on their tablet experience in greater detail. About half of the respondents said that tablets encouraged their attendance in class, and most respondents said that tablets helped them to perform better on regular EAC149 assignments.

Seven respondents said that tablet technology encouraged them to participate more actively in course activities. But only three said that the technology led to further discussions with classmates.

In general, students reported that tablet technology enhanced their classroom experience. “It helped me learn faster and participate more,” one said.

Some students said that tablets made it easier to find and organize information. “It made me want to attend an English class more,” explained one. “It was a good experience,” reported another.

e. Faculty Observations

In a report prepared in March 2011 as part of this project, faculty involved in teaching the EAC149 courses made observations about the impact of tablet technology and related software on their work.

They said that students required a brief orientation to the technology, which affected the amount of material covered in class, at least temporarily, but that the problem was addressed by inviting an in-class technology expert to assist with the orientation process.

They also stressed the importance of using the technology efficiently to accomplish learning outcomes and to avoid wasting time by focusing on the technology’s entertainment value.

In particular, faculty said that tablet technology was helpful for demonstrating exemplars related to the course, which set basic standards that students strive to achieve. It was also useful for taking and storing notes, simulating one-on-one tutorial conferences, and encouraging students to engage fully in their writing assignments, from brainstorming to outlining, drafting and revising their work. (See Appendices 1 to 6 for examples of this process.)

Faculty also said they required training on DyKnow interactive software to integrate it successfully into their teaching methodology.

A complete list of faculty observations is included in Appendix 10.

Conclusions

As an increasing proportion of students entering Seneca College and other community colleges in Ontario are placed into developmental writing courses, they face a pronounced risk of not graduating from their program. Effective methods of encouraging successful completion of their developmental course may increase students' chances of graduating from their programs.

In this project, we assessed the impact of tablet technology and DyKnow interactive software on the development of students' writing skills in a developmental writing course, EAC149. Our findings suggest that tablet technology and DyKnow interactive software had a measurable impact on students' attendance, participation and performance in the course.

Based on the analyses conducted during the project, tablet technology appears to enhance engagement and improve performance in EAC149. Given the relatively small yet measurable differences in performance between tablet and control groups, our evidence was not conclusive, but it suggests that further research should be conducted to explore in greater detail the impact of this technology on the success rate of developmental English programs.

Our exploration shows a noticeable difference in performance and engagement between tablet users and the control groups. Participants in the experimental group achieved higher levels of engagement and achievement throughout their course than participants in the control group.

Considering the preliminary nature of this project, our findings confirm the need for further refinements in content and delivery of remedial writing and reading programs involving tablet technology.

It is also apparent that technology alone will not transform current levels of student performance in remedial reading and writing classes. As we observed earlier, no single strategy will effectively and consistently raise the success rate of remedial programs. If such a transformation is possible, it will require the collective application of different methods, including tablet technology, learning communities, increased student-faculty interaction and/or individual counseling.

Recommendations

- To refine the simultaneous application of several strategies for improving student performance in developmental programs and to ensure that students derive maximum benefit from these strategies, further research is needed into the impact of tablet technology used in conjunction with one or more other strategies for increasing student success in remedial courses. These strategies may include accelerated learning programs (Roberts, 2012), the use/formation of learning communities (Richburg-Hayes, Lashawn, Visher & Bloom, 2008), increased student-faculty interaction (Peele, 2012), individual counseling and early assessment of high school students (McClenney, 2009).
- Developmental courses should be designed to accommodate tablet technology as an enhancement of the basic objectives rather than as an end in itself. As one of the faculty members involved in this project observed, "It is important to create not gimmicks but pedagogically relevant college-level activities to engage students."
- Further development is required of the content and application of DyKnow interactive software. Since the software was designed initially as a presentation tool, it should be enhanced and refined to maximize its efficiency in furthering communication and encouraging constructive feedback between students and faculty.
- Course design should also address the challenge, identified by faculty, of maintaining current levels of content delivered at a pace commensurate with the course delivered to the control group.

Technology should not impede the pedagogical objectives or restrict the delivery or content of the course. On the contrary, technology should allow for more refined delivery and content. Having determined that tablet technology contributes to improved student performance in EAC149, further research is required into the most effective ways of applying the technology.

- As they develop new uses for the technology, faculty should find effective ways of sharing the knowledge base that accumulates from their experiences in the classroom with each other.
- The DyKnow software should be refined and enhanced from its original concept as a presentation tool into a more robust interactive tool to enhance communication among students and faculty within a classroom environment.
- To encourage continuity within a student's college program, Seneca College should develop a tablet-based curriculum to support the delivery of EAC150, the basic college English course, into which students advance after their developmental course.
- Seneca College and other colleges should consider the development of online supports to use in conjunction with tablets.

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