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Effectiveness of a Hybrid Classroom in the Delivery of Medical Terminology Course Content

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Hybrid courses are emerging as a viable option for content delivery across college campuses. In an attempt to maximize learning outcomes while leveraging resources, one institution used several sections of a Medical Terminology course as a pilot. Traditional and hybrid course delivery were compared utilizing a quantitative research method to evaluate the effectiveness of a hybrid course design in meeting and/or exceeding course objectives, as determined by student satisfaction and perceptions. Both hybrid and traditional class groups agreed that Medical Terminology has potential to be delivered in a hybrid format, but the hybrid group's agreement was significant stronger (+0.38 points on 5-point scale, P=0.008).

Key words: hybrid course, flipped classroom, SOTL, STEM

Introduction

Beginning in early 2000, significant literature on hybrid courses began to emerge in the research on higher education. Initial studies examined retention rates of hybrid courses and found them to be higher than traditional classroom formats (Dziuban & Moskal, 2001; Gascoigne & Parnell, 2014; Vaughan, 2007). Further studies reported higher grades for students in hybrid courses in comparison to their traditional counterparts (Adams, 2013; Dziuban & Moskal, 2001; Twigg, 2003). Despite this, Tallent-Runnels et al. (2006) found that institutional support and guidelines for faculty and students varied widely, as do definitions of hybrid courses. Generally, hybrid courses are defined as "classes in which instruction takes place in a traditional classroom setting augmented by computer-based or online activities which can replace classroom seat time" (Scida & Saury, 2006). However consensus on a single best practice for hybrid course design and implementation remains elusive, due to a variety of factors (So & Brush, 2008; Westover & Westover, 2004).

Much of the literature regarding hybrid courses can be categorized as follows: defining hybrid courses; elements of successful integration of the traditional (face-to-face) material with online material; creating a classroom experience; and, theories of teaching and learning in an alternative format. The hybrid course can be as fluid or as rigid as the instructors design it and

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Aycock et al. (2002) point out that "time flexibility in hybrid courses is universally popular". Creating an opportunity to educate students in an alternative format may provide an increased appeal to students who might otherwise be reluctant to enroll in a class that has a formal or unyielding schedule. In a hybrid class, students benefit from both the traditional face-to-face instruction, and a self-directed, self-paced learning experience that blends elements from both pedagogies. Finding that right balance facilitates the teaching and learning experience (Aycock et al., 2002).

However, Jackson & Helms (2008) caution, "the hybrid format is stuck in the middle of two disparate pedagogies or extremes and appears to suffer from both the strengths and the weaknesses at either extreme". Their study identifies three central vantage points from which to consider the hybrid model: the student's, the faculty member's, and the administrations'. They cite several strengths to hybrid programs: the variety in content delivery provides "an excellent opportunity for students to be exposed to a new way of learning. (They) are exposed to learning interactively and in the classroom setting all at once" and the advancement of critical thinking skills, as students are challenged to complete significant portions of the work on their own. In contrast, they warn "it may not be an effective method of learning for some students" (Jackson & Helms, 2008).

Providing a variety of learning experiences and opportunities can enhance the hybrid course experience (Ausburn, 2004). The integration of the online material in an appropriate ratio to the in-class experience, as reported by Ausburn (2004), underscores the need for appropriate course design as aligned with the students' preferred learning strategies to include frequent interaction with classmates and instructors. Furthermore, Aycock (2002) found that successfully transitioning a course from a traditional format to a hybrid model requires a course redesign, not, simply adding "online work in addition to traditional coursework or simply to load lecture content, such as PowerPoint slides, online. The emphasis is on pedagogy, not technology".

Faculty and students alike are negotiating this new terrain and results are mixed, but offer a promising glimpse into this new educational venture. Aycock et al. (2002) note several key findings of effective hybrid courses stating that while "both the instructors and the students like the hybrid model; students don't grasp the hybrid concept readily" even if they are able to envision their plans to succeed. Ausburn (2004) noted that students in a hybrid course ranked "self-directed learning" as a one of their most important goals for learning (p. 330). Additionally, she noted that students listed "course announcements and reminders from the instructor" as well as "course information documents" (syllabus, schedules, outlines, grading procedures and policies) as the most valuable component of the online portion of the course (p. 330). The issue of creating a positive classroom experience to promote student learning is crucial to the success of a hybrid course. Delfino at al. (2005) states that a successful hybrid course "…seems to contribute to a higher level of socialization and sense of togetherness among participants and, consequently, to increase the quality of learning and the achievement of instructional objectives''. (p. 3).

With the myriad of definitions to describe hybrid courses, it is important to choose one that is generally accepted at the institution where the course redesign takes place. The description of a hybrid course provided by Delfino et al. (2005) most closely aligns with the way this study employed it, whereby instructional material is offered through the online sessions, allowing students to work through examples, and in class time is spent providing an overview of the content. Students in this study were informed on the first day of class that their sections would require significant self-direction and that there would be an opportunity after the course concluded, to voluntarily participate in a survey designed to assess their perceptions.

When implementing or revising curriculum or instruction, Tyler's (1949) four-step curriculum review model focuses on the learners' experience, similar to that of this study. The model focuses on the educational purposes, providing effective learning experiences to meet learning objectives, useful instruction, and the best manner in which to evaluate instruction and learning experiences. Like Tyler's model, this study aimed to find the most effective learning experiences, or delivery methods, to obtain optimal learning objectives. The manner in which course content is delivered and received is significant when teaching course material (Steele, 2006). "The fundamental administrative point, thus, is not the removal of content from the curriculum but, rather, to ensure that whatever the content, it can be successfully delivered and received" (p. 162). The purpose of this study was to compare the effectiveness of traditional and hybrid course designs in meeting and/or exceeding course objectives in the delivery of a one-semester Introduction to Medical Terminology course (Biomedical Sciences [BMS] 203) at Quinnipiac University. BMS 203 had been delivered in a traditional format at the institution for over 20 years and will likely continue a transition to a more hybrid-like classroom and/or a fully online experience. We hypothesized that delivery of hybrid course design for an Introduction to Medical Terminology course would be at least as effective as delivery in the traditional classroom format respective to the course objectives.

Methodology

The study was designed to compare the perceptions of traditional classroom students with hybrid classroom students to assess their experiences with the learning process; identify factors that influence their ability to meet the course objectives; and to compare the amount of time dedicated each week to the course in order to assure success. Course content between the traditional classroom format and the hybrid format was identical, as evidenced by syllabi and disciplinary norms for the teaching of medical terminology. McGuire (2009) states "students acquire knowledge of medical terminology by repeatedly encountering terms" (p. 46).

A survey response tool (Survey Monkey) was chosen as the most appropriate method to provide economy of design and efficient data collection (Nesbary, 2000; Sue & Ritter, 2007). Demographic questions were designed to gather information about past experience with online courses and future considerations about enrolling in an online course. Likert scales were provided to assess perceptions about the instructional methods and learning processes; as well as perceptions about the effectiveness of the course format. Values for the Likert scale questions were assigned as follows: 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree. A forced ranking scale was used to assess perceived value in educational and study factors in meeting course objectives (i.e., ranked from values of 1 to 6 with 1 being the first [highest agreement] to 6 being the last [least agreeable] choices). Additionally, an optional open-ended question was designed to allow participants to share additional thoughts regarding the course format. The open ended question asked respondents to "Please feel free to share any further thoughts/comments you may have about learning Medical Terminology through a Hybrid course format."

Gathering data from students who have completed the course in each format (hybrid and traditional) provides valuable insight into the effectiveness of teaching practices as well future pedagogical considerations in the course, department, and beyond. Two instructors across four sections of a hybrid course gathered data following completion of the course in order to compare students' perceptions of their experiences in the hybrid course delivery compared to four sections of students who were enrolled in the traditional course delivery during the previous academic year. Students were asked to voluntarily participate in a survey to assess four broad categories: previous

experience with online course delivery; time commitment needed, as perceived by the student, to succeed in the course; experience with meeting the course objectives as outlined in the syllabus; and overall satisfaction with the course delivery.

In accordance with Institutional Review Board (IRB) approval, a single-stage sampling of students (N = 206) who completed a semester of a 200-level Medical Terminology course, BMS 203: Introduction to Medical Terminology at a four-year, private, mid-sized co-educational institution (Quinnipiac University) contacted via email to request their voluntary participation in a brief on-line survey to evaluate the effectiveness of a hybrid course design in meeting and/or exceeding course objectives in the delivery. Students (n = 101) from all four enrolled sections of a traditional classroom format from the previous academic year; and students (n = 105) from all four enrolled sections of the hybrid format were invited to participate in the study. All students were contacted via email. The email outlined the procedures for the study, which included a brief description of the study, purpose and value as well as commentary regarding any perceived risks and benefits to be neither. A follow-up email was sent two weeks later as a reminder. Both emails clearly stated that participation in the study was voluntary and confidential, and that data would be pooled on a survey response website (Survey Monkey) in a password protected file. No identifiers would be used and students were free to answer candidly. The study was purposefully narrow in scope in order to determine if a curricular change at a single institution could be supported by shifting a traditional medical terminology course to a hybrid model.

Data Analysis

Following data collection to detect outliers, z-scores were generated resulting in the identification and deletion of 6 outliers ($z \geq \pm 3.0$) from the data set (<0.005% of all data points). Ordinal data (i.e. rank and scale items) were analyzed by Mann Whitney U tests. An alpha level of $P < 0.05$ was required for statistical significance. All statistical analyses were performed using SPSS version 22.0 for Windows (SPSS, Chicago, IL, USA). Data are presented as mean ± SD.

Findings

Demographics

Seventy-nine students completed the survey (38.3%) with forty-one (40.6%) and thirty-eight (36.2%) respondents from the traditional and hybrid classrooms, respectively. Fourteen (36.8%) and twenty (48.8%) respondents from the traditional and hybrid classrooms, respectively, reported previous experience with online courses (P = 0.287; Table 1). In addition, only two (5.3%) and one (2.4%) respondent(s) from the traditional and hybrid classrooms, respectively, reported that they would not consider enrolling in an online course. Five (13.2%) hybrid and eight (19.5%) traditional classroom respondents responded "I don't know" with regards to considering online class enrollment. There were no significant differences between groups in previous experience with online courses or consideration for enrollment in online courses.

Table 1. Respondent demographics

		Hybrid (n=38)	**Traditional (n=41)**	
Item	*Question*	*Mean ± SD*	*Mean ± SD*	*P-value*
1	I took Medical Terminology in a traditional classroom format (i.e. BEFORE Spring 2014).	0.00 ± 0.00	1.00 ± 0.00	< 0.001
2	I have previous experience with online courses.	0.37 ± 0.49	0.49 ± 0.51	0.287
3	I would consider enrolling in an online course.	0.94 ± 0.24	0.97 ± 0.17	0.558

Data are presented as mean ± SD. Items 1 and 2 were presented as questions with responses limited to No and Yes. Item 3 was presented as a question with responses limited to *No*, *Yes*, and *I don't know*. Values assigned were as follows: *No*, 0; *Yes*, 1; and *I don't know*, n/a. Comparisons between a hybrid, flipped classroom and a traditional course format were made using a Mann Whitney U test. *P*-value < 0.05 denotes statistical significance.

Medical Terminology Instructional Methods and Learning Processes

Table 2 shows mean group responses to six 5-point Likert-scale questions designed to evaluate students' perceived effectiveness of medical terminology instructional methods and the associated learning processes. No significant difference was found between groups with regards to perceived value of in-class instruction (Items 4c, 4f). In fact, on average, both groups disagreed (mean value < 3.0) with the notion that they learned most content in class or that the material needed to be 'taught' in the classroom. Both hybrid and traditional class groups agreed that medical terminology has potential to be delivered in a hybrid format, but the hybrid group's agreement was significant stronger (+0.38 points on 5-point scale, P=0.008).

Similarly, both groups did not agree that medical terminology is best offered in a traditional format with hybrid respondents demonstrating a significantly lower response value, on average (-0.44 points on 5-point scale, P=0.025). Items 4d and 4e were designed to evaluate students' perceived requirements for self-directed learning of Medical Terminology. For both items, hybrid classroom respondents demonstrated significantly greater agreement with statements indicating self-directed learning (+0.55 and +0.34 points on a 5-point scale for items 4d and 4e, respectively, P<0.05).

Table 2. Student responses to 5-point Likert scale statements evaluating Medical Terminology instructional methods and learning processes

		Hybrid (n=38)	**Traditional (n=41)**	
Item	Statement	Mean ± SD	Mean ± SD	*P*-value
4a	Medical Terminology is a course that has the potential to be successfully offered as a hybrid format.	4.58 ± 0.55	4.20 ± 0.65	0.008
4b	Medical Terminology is best offered as a traditional in-class format.	2.71 ± 1.01	3.15 ± 0.88	0.025
4c	I learned most of the Medical Terminology content by attending class.	2.55 ± 1.01	2.73 ± 1.25	0.694
4d	A course such as Medical Terminology requires the student to commit significant out-of class time to learn the material in order to facilitate student success.	4.47 ± 0.56	3.93 ± 1.01	0.014
4e	I learned much of the course material 'on my own' and used the classroom time to review key concepts	4.54 ± 0.56	4.20 ± 0.72	0.032
4f	In order to succeed in a course such as Medical Terminology the student needs to have the material 'taught' to them by an instructor in a classroom	2.21 ± 0.66	2.22 ± 0.96	0.702

Data are presented as mean ± SD. Items 4a through 4f were presented as statements with respondents asked to rate their agreement using a 5-point Likert-scale. Values assigned were as follows: *strongly disagree*, 1; *disagree*, 2; *neutral*, 3; *agree*, 4; and *strongly agree*, 5. Comparisons between a hybrid, flipped classroom and a traditional classroom format were made using a Mann Whitney U test. *P*-value < 0.05 denotes statistical significance.

Effectiveness of course formats

Table 3 shows mean group responses to four 5-point Likert-scale questions designed to evaluate the capability of the course formats in meeting the course objectives. Respondents from both groups agreed that the course effectively developed the students' ability to translate unfamiliar medical terms, construct acceptable new medical terms from their description(s), pronounce medical terms, and read case studies while defining words in context. There were no significant differences between groups with regards to the course format's effectiveness, except in item 5d, where hybrid classroom respondents' indicated lesser agreement with 'the ability to read case studies and define words in context' in (-0.32 points on a 5-point scale, *P*=0.020).

Table 3. Student responses to 5-point Likert-scale questions evaluating the effectiveness of the course to meet course objectives

		Hybrid (n=38)	**Traditional (n=41)**	
Item	Question	Mean ± SD	Mean ± SD	*P*-value
5a	At the completion of the course, I was able to literally translate unfamiliar medical terms by analysis of word parts.	4.66 ± 0.48	4.68 ± 0.47	0.814
5b	At the completion of the course, I was able to construct acceptable new words from their description(s).	4.57 ± 0.55	4.61 ± 0.59	0.632
5c	At the completion of the course I was able to pronounce medical terms correctly.	4.32 ± 0.57	4.44 ± 0.59	0.318
5d	At the completion of the course, I was able to read case studies and define words in context.	4.24 ± 0.63	4.56 ± 0.55	0.020

Data are presented as mean ± SD. Items 5a through 5d were presented as statements with respondents asked to rate their agreement using a 5-point Likert-scale. Values assigned were as follows: *strongly disagree*, 1; *disagree*, 2; *neutral*, 3; *agree*, 4; and *strongly agree*, 5. Comparisons between a hybrid, flipped classroom and a traditional classroom format were made using a Mann Whitney U test. *P*-value < 0.05 denotes statistical significance.

Students' perceived value in educational and study factors in meeting course objectives

Table 4 shows mean group responses to a 7-point ranking question (1= best choice, 7=worst choice) designed to evaluate factors in the students' ability to meet course objectives. Respondents from both groups agreed that their own commitment to learning/studying the material (item 6c) and the textbook (item 6d) were the most important factors. However, hybrid classroom respondents indicated that the in-class activities (item 6b) were significantly more important in their ability to meet the course objectives (ranks: 3 vs. 6 for hybrid vs. traditional respondents, respectively; *P*=0.019). There were no significant differences in ranks of any other factor (items 6a, 6e-g). In addition, a between groups difference in self-reported study time dedicated to medical terminology approached significance, but did not meet the requisite alpha level of 0.05 (2.16 vs. 1.90 on 4-point scale for hybrid and traditional classroom respondents, respectively, where a value of 1 indicates <2 hours/week, 2 = 2-4 hours/week, and 3= 4-6 hours/week; *P*=0.073).

Table 4. Student responses to 7-point ranking question evaluating the students' perceived ability to meet the course objectives

		Hybrid (n=38)	Traditional (n=41)	
Item	Statement	Mean ± SD	Mean ± SD	*P*-value
6a	My ability to meet the course objectives was due to: the in-class instruction.	4.11 ± 1.54	4.05 ± 1.50	0.943
6b	My ability to meet the course objectives was due to: the in-class activities.	3.95 ± 1.39	4.70 ± 1.47	0.019
6c	My ability to meet the course objectives was due to: my own commitment to learning/studying the material.	1.74 ± 0.92	1.61 ± 0.89	0.449
6d	My ability to meet the course objectives was due to: the textbook.	2.32 ± 1.43	2.39 ± 1.22	0.465
6e	My ability to meet the course objectives was due to: the ease/difficulty of the material.	4.19 ± 1.13	3.76 ± 1.24	0.119
6f	My ability to meet the course objectives was due to: previous experience with the material.	4.67 ± 1.85	4.66 ± 1.57	0.794
6g	My ability to meet the course objectives was due to: some other factor(s).	6.87 ± 0.34	6.83 ± 0.45	0.837

Data are presented as mean ± SD. Items 6a through 6g were presented as statements with respondents asked to consider all statements and rank each from 1 through 7. A value of 1 was associated with the respondent's first (e.g. best) choice, whereas a value of 7 was associated with the respondent's last (or worst) choice. Comparisons between a hybrid, flipped classroom and a traditional classroom format were made using a Mann Whitney U test. *P*-value < 0.05 denotes statistical significance.

Conclusions

Several conclusions may be drawn from the data, most notably that students in the hybrid courses perceive that a medical terminology course offered in a hybrid format can be a potentially successful model of instruction ($p = 0.005$), even if it requires more out of class time to learn ($p = 0.044$). While only one of 14 students (7%) who chose to answer the open -ended question stated: "I probably would not have taken this course if it was in hybrid format. I like the traditional classroom style", the majority of open-ended comments were positive (64%) or neutral (21%). Several comments indicated that a hybrid model was conducive to learning and integrating course material, including the higher level thinking required for application and synthesis of word construction and meaning. One student stated, "I like the hybrid course format because it helped me integrate what I learned to studying outside of class independently without feeling lost on the material."

A sample of comments from two other students in the hybrid sections:

> I think that Med Term [*sic*] has great potential to be offered as a hybrid course. I enjoyed this format during my time taking the course in Spring 2014 semester. Learning the material on your own keeps things more interesting than spending 50 minutes just going over words. Also, the in class activities help reinforce the material that was studied outside of class. Such reinforcement helps facilitate the learning of these terms.
>
> My learning took place solely outside of the classroom. I felt as is the class time was not needed, because all we did was review the vocabulary terms. This seemed tedious, since I already studied the words outside of the class. This class is extremely useful, but it can be structured differently because the classroom time is not needed.

As this study suggests, students are open to varying delivery methods of course content. With an ongoing emphasis regarding content delivery in higher education, hybrid courses can be a viable manner in which to deliver course content. Courses heavily rooted in foundational knowledge concepts such as memorization, pronunciation, repetition, and scaffolding, such as medical terminology courses, could especially benefit from such a course format. Courses such as medical terminology, which require an ability to decode constructed terms and rely less heavily on higher-level cognitive skill such as analysis and evaluation, offered in a hybrid format may prove to be a successful alternative to traditional classroom format; particularly when combined with in-class activities designed to reinforce concepts.

To provide effective hybrid courses, criteria must align with institutional pedagogy. Furthermore, course content should be integrated online with a focus on learning experience and instruction should be evaluated for effectiveness in meeting the learning objectives. Hybrid courses can benefit institutional retention, provide more flexibility in schedule, improve how students learn course content and meet learning objectives, as well as keep students engaged when designed purposefully. While efforts at refining pedagogies that most appropriately meet students' needs and expectations continue to evolve, it is worth considering an evolution of course content delivery, as well.

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