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CURRICULAR INFUSION IN TECHNOLOGY MANAGEMENT EDUCATION PROGRAMMES

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Abstract:
Technology management is a set of systematic ways for managing the process of using knowledge to expand human activities and produce specific products. It is about bringing people and technologies together to do what people anticipate. The best ideas from academic, practitioner, generalist, and technological perspectives are combined in technology management education. Cdurriculum Infusion is one such idea but the reports of its effectiveless vary. Its effectiveless may improve when it is combined with other pedagogic methods like project based learning. Using a quasi-experimental method this study finds that combined with project based learning, curriculum infusion is more effective than traditional methods.

Keywords: Curriculum infusion, Project based learning, Technology manangement

Introduction

In today's rapidly evolving technological landscape, the successful management of technology has become an essential component for organizations to remain competitive and thrive in the global market. To prepare future leaders capable of navigating this complex environment, educational institutions have recognized the need to incorporate technology management education programs into their curriculum. These programs aim to equip students with the knowledge, skills and perspectives necessary to effectively leverage technology to drive innovation and strategic decision-making within organizations.

Traditionally, technology management education programs have relied on a disciplinary-specific approach, focusing on core concepts and principles related to technology and management. However, the fast-paced nature of technological advancements and the ever-increasing interdependence between technology and business functions require a more holistic and integrative educational approach. This is where curricular infusion (CI), as a pedagogical strategy, comes into play.

CI involves the deliberate integration of technology management principles, concepts and applications across multiple disciplines within an educational program. It seeks to create a seamless connection between technology and management, allowing students to understand the strategic implications of technology across various functional areas such as marketing, finance, operations and human resources. By infusing technology management throughout the curriculum, students gain a comprehensive understanding of the role of technology in modern business environments and develop the ability to effectively leverage it for organizational success.

The effectiveness of CI in technology management education programs is a topic of growing interest and importance within the field of education. Educators and researchers have increasingly recognized the potential benefits of this approach, including enhanced student engagement, improved critical thinking skills and the ability to apply knowledge to real-world problems. Moreover, CI fosters interdisciplinary collaboration, encouraging students to work across boundaries and develop a broader perspective on technology's impact on organizational dynamics.

While CI holds significant promise, there is a need for empirical evidence to evaluate its effectiveness in achieving the desired learning outcomes and preparing students for technology management roles. This paper aims to explore and assess the effectiveness of CI in technology management education programs through a comprehensive analysis of existing literature, case studies and empirical research. By critically examining the strengths, limitations and potential challenges associated with this approach, we can shed light on its practical implications and offer recommendations for its implementation and refinement.

This study seeks to contribute to the ongoing discourse on technology management education by examining the effectiveness of CI. Through an exploration of existing research and an analysis of relevant empirical evidence, we aim to provide insights into the benefits, challenges and potential future directions of this pedagogical approach. Ultimately, this research endeavors to inform educators, administrators and curriculum developers in their efforts to design and deliver effective technology management education programs that meet the evolving needs of today's technologically-driven business landscape.

Literature Review

CI is a pedagogic method in which instructors use material from different subjects and focus on a theme [1]. Although some CI interventions may consist of as little as an instructor devoting a part of one class meeting to a guest speaker, interventions may take more integrated forms up to infuse the topic into an entire course [2]. Many CI efforts in higher education have focused on the inhibition of aberrant behaviour [3-5]. However, there have also been efforts to use CI to focus on additional areas of health and wellness such as mental health. As explained by Houghton and Anderson, “addressing mental well-being as a content area within curricula is of intrinsic value – given its importance as a key societal concern. Through raising awareness, it also increases the likelihood that students may be more effective at managing their own well-being and able to access appropriate support, where necessary – both for themselves and one another” [6, p.18]. Additionally, faculty may lack knowledge of the opportunities that CI can provide to connect these discussions to the learning in their classrooms [7]. CI has not received much attention in terms of a pedagogical approach likely, in part, due to varying reports of its effectiveness.

CI projects have shown ambiguous results. In a study of nursing students participating in a CI project involving self-reflection about mental health, a greater need to practice self-care was identified [8]. In a study of a CI project around college student alcohol use, it was found that actual high-risk drinking behaviors were only lowered in men [5]. Another study found increased understanding of mental health issues among faculty, but no significant increase in referrals to the campus counseling center when implementing a class project on mental health [4]. It seems appropriate that the effectiveness of CI within specific instructional methods like project-based learning (PBL), be examined.

PBL is an alternative approach to more traditional, teacher-led instruction [9]. Students engaging in PBL complete projects in real-world contexts by which they gain knowledge and skills (e.g., teamwork, community engagement, personal care, etc.) via real-world application and culminates in a final product [9, 10]. Additionally, students working in teams to solve complex problems in real-world situations [10,11]. This may explain why students engaged in PBL projects report increases in engagement, positive attitudes toward PBL and increases on student creativity, teamwork and communication [10-12]. PBL is also related positively to learning outcomes like entrepreneurial skills [13].

A meta-analysis by Chen and Yang (2019) which analyzes data from 30 articles covering 12,585 students demonstrated that PBL's medium to large influence on student learning over traditional instructional approaches. Due to its focus on developing applied skills via projects, its particularly useful within business settings and for technology management classrooms [14].

Although the effectiveness of CI is inconclusive, the effectiveness of PBL has received support [15]. Thus, infusing student wellness information specifically within PBL may help technology management students. This research creates a comprehensive framework, examining the effectiveness of the method across organizational, societal, personal and professional outcomes.

Hypotheses

H1: Technology management students participating in CI within PBL will have a better understanding of the health needs of other students and campus health initiatives than students participating in a traditional class project.

H2: Technology management students participating in CI with PBL will report lower levels of stress than students participating in a traditional class project.

H3: Technology management *s*tudents participating in CI within PBL will gain more knowledge of traditional course concepts, such as improving interpersonal skills and developing critical thinking skills than students participating in a traditional class project.

H4: Technology management students participating in CI within PBL will be better able to apply course concepts, like designing team projects and leading teams, to work contexts than students participating in a traditional class project.

Method

Research Design

Participants in the study were technology management students in Moldova. In the CI group, the campus office specialising in education and student messaging about health and wellness issues partnered with the instructor on a project aimed at increasing student awareness of the office, campus student health and wellness issues and initiatives and stress management. The project included an initial discussion with the campus partner office about wellness topics and which health messaging was most important, i.e., stress. Students in each class were then sent and completed a measure of stress [16].

Each student team was then asked to research student stress and learn how to design surveys to administer to students on campus asking about student stress. Student teams developed recommendations based on their data analysis for the campus partner office about how to reach students on campus regarding stress. Student teams then presented their project

and recommendations to both the course instructor and campus partner. The course instructor and the campus partner evaluated the student team's recommendations.

In the control group, the course had the same content-related learning objectives, but used an in-class, semester-long role-play-based project which involved students working in teams to prepare and present role plays illustrating course content. Pre- and post- measures were completed by students.

Three items were used to measure organisational-societal curriculum-infusion wellness benefits. The questions included, "This project helped me to better understand the health needs of students on campus", "This project helped me to better understand how to help my campus community" and "Do you feel like you learned more about campus health initiatives by completing this project?".

For measuring stress, personal curriculum-infusion wellness benefits students completed 10 items. Items included "In the last month, how often have you been upset because of something that happened unexpectedly?" and "In the last month, how often have you felt that you were unable to control the important things in your life?".

As a scale to measure the effectiveness of CI-PBL projects in providing technology management students with professional knowledge and performance of course concepts and skills could not be identified directly, five items were adapted from service-learning scales [17, 18]. Items included, "This project helped me to improve my interpersonal skills" and "This project helped me to develop my critical thinking skills".

To measure the effectiveness of CI-PBL projects in providing technology management students with professional knowledge and performance of course concepts and skills, Items included "This project helped me to better understand how to design team projects than course material alone" and "This project helped me to better understand how to lead team projects than course material alone" and "This project helped me to develop my team-working skills". These items represent teaming skills which meet the objectives of the course.

Results

Table 1 presents the correlations between survey items while table 2 compares the outcomes relating to the two groups.

Table 1: Correlations

	1	2	3	4	5	6	7	8
1. Increased knowledge of campus health initiatives by completing this project?	-							
2. Better application of course material to work situations	.46**	-						
3. Development of managerial skills	.49**	.77**	-					
4. Improvement of interpersonal skills	.50**	.66**	.63**	-				
5. Development of problem-solving skills	.32**	.82**	.79**	.62**	-			

6. Development of critical-thinking skills	.45**	.78**	.74**	.61**	.74**	-		
7. Development of how to design team projects (better than course material alone)	.32**	.68**	.58**	.58**	.61**	.58**	-	
8. Understanding of leading team projects (better than course material alone)	.36**	.72**	.64**	.59**	.68**	.74**	.74**	-
9. Increase in team-working skills	.37**	.63**	.59**	.66**	.58**	.58**	.54**	.592*

Table 2: Comparisdon between CI and Traditional Project Conditions

	C.I. Project		*Traditional Project*			
	M	*S.D.*	*M*	*S.D.*	*t(74)*	*p*
1. Increased knowledge of campus health initiatives by completing this project?	4.46	.87	3.29	.71	6.40	<.001
2. Better application of course material to work situations	4.12	.87	3.63	1.03	2.26	.03
3. Development of managerial skills	4.20	.84	3.68	.98	2.50	.02
4. Improvement of interpersonal skills	4.20	.84	3.34	.91	4.23	<.001
5. Development of problem-solving skills	4.05	.97	3.79	.98	1.13	.23
6. Development of critical-thinking skills	4.27	.87	3.68	1.15	2.54	.01
7. Development of how to design team projects (better than course material alone)	3.93	.96	3.66	.80	1.32	.19
8. Understanding of leading team projects (better than course material alone)	3.93	1.01	3.49	1.10	1.83	.07
9. Increase in team-working skills	4.12	.93	3.59	1.08	2.31	.02

Participants in the CI condition knew more about about campus health initiatives (M = 4.46, SD, .87) than in the control group (M = 3.29, SD = .71), $t(74) = 6.40$, $p < .001$). Thus, H1 was supported.

To test H2, a t-test comparing a pre and post-measure of stress in the CI class condition was conducted to test H2. The test was not significant and thus H2 was not supported.

To test H3, the items measuring course benefits in the CI condition were compared to the data from the control condition. Students in the CI condition reported the project would better help them to apply course material to work situations (M = 4.12, SD, .87) than in the control group. Students in the CI condition reported the project would better help them to develop their management skills (M = 4.20, SD, .84) than in the control group (M = 3.68, SD = .98), $t(74) = 2.50$, $p = .02$). Students in the CI condition reported the project would better help them to develop their interpersonal skills (M = 4.20, SD, .84) than in the control group partiipants. (M = 3.34, SD = .91), $t(74) = 4.23$, $p < .001$). Students in the CI condition reported the project would better help them to develop their critical-thinking skills (M = 4.27, SD, .87) than in the control group (M = 3.67, SD = 1.15), $t(74) = 2.54$, $p = .01$). The reported differences across conditions for the development of problem-solving skills was not significant. Thus, H3 was partially supported.

To test H4, 3 items measuring discipline-specific outcomes in the CI condition were compared to the data from the control condition. Students in the CI condition reported the project better helped them improve their team-working skills (M = 4.12, SD = .93) than the control group participants (M = 3.59, SD = 1.08), $t(74) = 2.31$, $p = .02$). Items assessing team design and team leadership were not significantly different than the control condition, thus H4 was partially supported.

Discussion

The study's findings indicate that CI can be an effective way to teach technology management students about campus health-related programs, initiatives and student health needs when infused within PBL. While other studies document the effectiveness of direct health skills training in the classroom [19], this research takes an integrated approach and did not see evidence of stress reduction. Moreover, CI can be implemented within PBL without detracting from students' ability to gain traditional course-related knowledge and skills. As business courses are particularly situated to use applied problem-solving via PBL, CI via PBL should be considered as a primary method for effectively engaging with and disseminating information to, business students.

In the current study, students in the CI-PBL condition reported higher levels of personal, organizational and social outcomes in that reported higher levels of learning about student wellness, campus health initiatives and better understood the health needs of students on campus. As students learned how to research, collect and analyze student information, they could also bring this awareness and skills to their future work in organizational settings.

At the personal level, as knowledge of resources increases help-seeking behaviors and CI could be a useful approach for reaching students. Considering the need for flexibility in teaching modalities due to the changes in both work and educational environments it is important to determine if a similar project could be successfully implemented online. However, students in the CI-PBL condition did not report decreases in stress reduction. As students were taught about and asked to focus on student health topics, but were not directly taught stress-reduction skills like yoga or meditation which are known to reduce stress [20-24].

Of interest at the performance level, was whether students could engage in CI within PBL and receive effective instruction in areas relevant to gaining desired managerial skills over and above traditional experiential classroom projects. In the current study, students in the CI condition reported PBL would better help them to apply course material to work situations,

better help them to develop their management and other skills. The reported differences across conditions for the development of problem-solving skills was not significant.

This research tested whether students could engage in CI and receive effective instruction of the primary course learning objectives within PBL (i.e., team-working skills and leadership) as compared to traditional classroom projects. Students in the CI-PBL condition reported the project better helped them improve their team-working skills. Items assessing team design and team leadership were not significantly different than the control condition. Additionally, although the current study looked at the effectiveness of infusing student wellness initiatives, organizational behavior topics such as conflict resolution, technology applications, leadership and teaming, could be infused throughout courses.

Conclusion

Role of CI in management education is increasingly being recognised [25, 26]. CI within PBL may provide an effective way of reaching technology management students within the classroom setting about health and wellness topics that may otherwise go unaddressed and delivering course material. Additionally, within the classroom setting, CI-PBL can be implemented throughout the course effectively, educating technology students for their all round benfit.

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