An exploratory study of the relationship between the use of the Learning Commons and students' perceived learning outcomes

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ABSTRACT

This study proposes and empirically tests a model explicating the impact of the Learning Commons on university students' learning behaviors and skills development. Adapting the information literacy instruction model that is based on expectation disconfirmation theory, a series of hypotheses were developed, and data were collected through an online survey at a Hong Kong university. Responses from 388 students were subjected to a partial least squares structural equation modeling analysis. The results suggest that expectation disconfirmation theory can be applied in the domain of the Learning Commons, and that the degree to which students' expectations are confirmed affects their degree of perceived quality of and satisfaction with the Learning Commons. Perceived quality in turn influences satisfaction. Both perceived quality and satisfaction lead to psychological outcomes that produce behavioral changes and possible benefits, including time savings, effort reduction, better grades, advanced problem-solving skills, and improved learning outcomes.

Introduction

To help students effectively and efficiently access and use information, some universities introduced a kind of informal learning space called the Information Commons. With the unprecedented change in the learning environment accompanying the new millennium, a natural extension of the Information Commons, called the Learning Commons, was initiated, bringing in partners from other university departments for collaborative learning opportunities and various interactive activities. The Learning Commons have been described as "the physical, digital, human, and social resources supporting Information Commons that are organized in collaboration with learning initiatives sponsored by other academic units, or aligned with learning outcomes defined through a cooperative process" (Beagle, Bailey, & Tierney, 2006, p. 1).

After its introduction, the Learning Commons model has attracted much attention of the research community, resulting in an increasing number of empirical studies of academic libraries (Kim, 2017; Li, Wu, & Su, 2018; Nitecki & Simpson, 2016; Thomas, Van Horne, Jacobson, & Anson, 2015). Similar to other user experience studies, by examining user perceptions and the use of complex library services and facilities, it is possible to develop an understanding of the key factors affecting the satisfaction and behavior of students in physical spaces. With more resources and effort being channeled into student-centric services in higher education, the evaluation of the Learning Commons emerges as an area that merits further study. This area is particularly challenging when traditional usage-based methods for assessing campus services appear inadequate because the Learning Commons offer sophisticated facilities and services (Bennett, 2011).

The present study develops a model to empirically test whether prior expectations, perceived quality, and satisfaction can help to explain how students' learning behavior and skills development are influenced by the Learning Commons. Efforts are also made to complement and triangulate the survey results with qualitative data collected from semi-structured interviews with survey respondents. Interviews are one of the ethnographic methods commonly employed in user experience research that can help enhance the credibility of research through thick description and concrete details (Priestner & Borg, 2016; Tracy, 2010).

Theoretical background

User expectations and satisfaction

To understand whether the commons model facilitates the development of information literacy and digital literacy skills in a

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technology-rich environment, this study adapts a model used to explore the causal relationships between students' expectations, perceived quality, and satisfaction and the outcomes of their information literacy instruction (ILI). The model, created by Serenko, Detlor, Julien, and Booker (2012), adopts expectation disconfirmation theory (EDT) (Bhattacherjee, 2001), originally developed in the marketing discipline and later applied in information systems research. This study argues that the model developed by Serenko et al. (2012) for ILI-related services can be adapted to the Learning Commons environment. The argument is based on the premise that the conceptualizations of ILI and the Learning Commons share several key features, such as the same target users and a technology rich learning environment.

Applying EDT in an education-related context of the Learning Commons, it is assumed that students first develop their prior expectations based on the information available on the university's website, discussions with peers, and university promotional materials. After direct exposure to the university's Learning Commons, students develop their actual perceptions of the commons. They then compare their actual perceptions with their prior expectations. If their actual experience meets or exceeds their initial expectations, a positive disconfirmation takes place, leading to higher perceptions of quality and satisfaction. A negative disconfirmation occurs when the situation is reversed. As such, the degree of expectation disconfirmation determines the students' level of perceived quality and satisfaction with the Learning Commons. Perceived quality also leads to satisfaction because students who find the quality of the Learning Commons to be high are also likely to become more satisfied with the Learning Commons. In the field of post-secondary education, students' satisfaction is influenced by a variety of factors, the most important of which is the perceived quality of the program, facility, or service (Serenko, 2011). Thus, EDT has helped to form the conceptual foundation for this study's framework and facilitated the development of a series of hypotheses.

Hypotheses development

Based on the discussion in the previous section, a set of hypotheses is put forward as the basis for a model that explicates the relationships between expectation disconfirmation, perceived quality, and satisfaction with the Learning Commons. Fig. 1 presents the research model, constructs, and hypotheses.

The research model has been built on the premise of three hypotheses:

H1. Expectation disconfirmation of the Learning Commons is positively associated with the perceived quality of the Learning Commons.

H2. Expectation disconfirmation of the Learning Commons is positively associated with student satisfaction with the Learning Commons.

H3. The perceived quality of the Learning Commons is positively associated with student satisfaction with the Learning Commons.

The ultimate goal of the Learning Commons is to facilitate changes in student behavior, which may then deliver beneficial outcomes. However, the theory of reasoned action and the theory of planned behavior posit that every conscious action must be preceded by relevant mental processes (Netemeyer, Ryn, & Ajzen, 1991). Therefore, students' perceptions of the quality of the Learning Commons and their satisfaction with them are expected to initially trigger cognitive changes, referred to as psychological outcomes, which lead to behavioral outcomes that are expected to produce benefit outcomes. Four hypotheses to test the above assumption are presented below:

H4. Perceived quality of the Learning Commons is positively associated with the psychological outcomes of the Learning Commons.

H5. Student satisfaction with the Learning Commons is positively associated with the psychological outcomes of the Learning Commons.

H6. Psychological outcomes of the Learning Commons are positively associated with the behavioral outcomes of the Learning Commons.

H7. Behavioral outcomes of the Learning Commons are positively associated with the benefit outcomes of the Learning Commons.

Building on the findings of Serenko et al. (2012), this study hypothesizes that higher perceived quality and satisfaction first affect students' mental state by decreasing their virtual learning environment anxiety, increasing their virtual learning environment self-efficacy, improving their perceptions of the virtual learning environment, improving their perceptions of other Learning Commons values, and improving their perceptions of the facility personnel's helpfulness. These factors are believed to be relevant in the Learning Commons context. The following hypotheses are proposed to test the above assumptions.

H8-1. Decreased virtual learning environment anxiety is part of the psychological outcomes of the Learning Commons.

H8-2. Increased virtual learning environment self-efficacy is part of the psychological outcomes of the Learning Commons.

H8-3. Improved perceptions of virtual learning environment are part of the psychological outcomes of the Learning Commons.

H8-4. Improved perceptions of the value of other informal learning spaces are part of the psychological outcomes of the Learning Commons.

H8-5. Improved perceptions of facility personnel's helpfulness are part of the psychological outcomes of the Learning Commons.

Psychological outcomes have a positive direct effect on behavioral outcomes, which include increased use of the virtual learning environment, increased use of the facility personnel's services, improved use of the facility personnel's services, improved use of other informal learning spaces, and increased use of other informal learning spaces. This suggests that the increased and improved use of other informal learning spaces are important behavioral outcomes. The following hypotheses are proposed.

H9-1. Increased use of the virtual learning environment is part of the behavioral outcomes of the Learning Commons.

H9-2. Increased use of the facility personnel's services is part of the behavioral outcomes of the Learning Commons.

H9-3. Improved use of the facility personnel's services is part of the behavioral outcomes of the Learning Commons.

H9-4. Increased use of other informal learning spaces is part of the behavioral outcomes of the Learning Commons.

H9-5. Improved use of other informal learning spaces is part of the behavioral outcomes of the Learning Commons.

From the perspective of both students and educators, the goal of Learning Commons implementation is to produce tangible outcomes for the benefit of all stakeholders. In this study, it is suggested that psychological outcomes produce several benefit outcomes, namely time savings, effort reduction, grades/coursework benefits, collaborative problem solving skills improvement, and improved learning outcomes. Thus, the following hypotheses are proposed.

H10-1. Efficiency gains in time savings are part of the benefit outcomes of the Learning Commons.

H10-2. Efficiency gains in effort reduction are part of the benefit outcomes of the Learning Commons.

H10-3. Effectiveness gains in higher grades and coursework impact are part of the benefit outcomes of the Learning Commons.

H10-4. Effectiveness gains in collaborative problem solving skills improvement are part of the benefit outcomes of the Learning
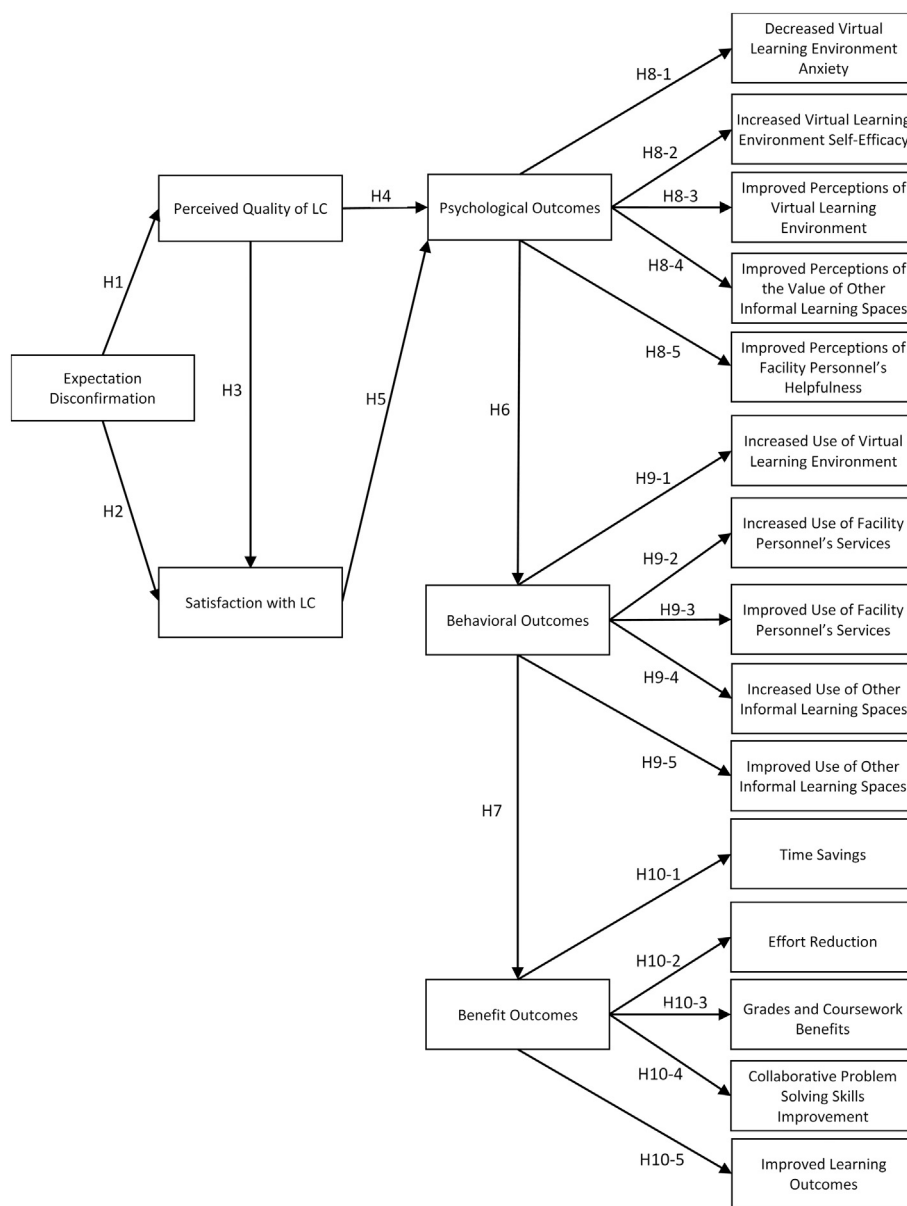
Fig. 1. The research model (LC - the Learning Commons).

Commons.

H10-5. Improved learning outcomes are part of the benefit outcomes of the Learning Commons.

Methodology

In this study, the University of Hong Kong (HKU) was selected as the research site. With an increasingly globalized student population, HKU added an excellent multicultural perspective to the study of learning spaces. HKU is a mature research university offering a wide range of undergraduate and graduate programs in ten major disciplines, attracting students from very diverse academic backgrounds. The HKU Learning Commons facilities include two distinct physical locations: Chi Wah Learning Commons (CWLC), a 60,000-square-foot commons managed by the Information Technology Services, and Level 3, a 30,000-square-foot commons managed by the University Libraries. Both facilities are well equipped with Wi-Fi network connectivity and other advanced pedagogical information technologies and support services (see Appendix 1). All students have equal access to both facilities.

An online self-administered survey was distributed to all HKU students via a mass email message from the Libraries in late March 2015, with a closing date in early April 2015. The quantitative data obtained from the survey were analyzed by using SmartPLS (Ringle, Wende, & Becker, 2015), a software program used for variance-based structural equation modeling (SEM) using partial least squares (PLS). SEM is a powerful multivariate data analysis technique that analyzes the measurement and structural models simultaneously. PLS was selected for this study because it is a robust SEM tool that supports the use of second-order constructs (Wetzels, Odekerken-Schröder, & van Oppen, 2009).

As a starting point, some of the model's constructs were operationalized by adapting the instrument developed by Serenko et al. (2012). Other constructs were operationalized based on previous studies of learning spaces and behaviors in higher education. Except for the questions on demographic information and the frequency of visits, all of the items were measured on a 7-point agree/disagree Likert-type scale.

Student perceptions of the virtual learning environment as

psychological and behavioral outcomes were based on literature pertaining to the impact of technologically-enhanced learning environments on student learning (Brooks, 2011). Other kinds of Learning Commons impacts reported in the literature were also adapted as psychological, behavioral, and benefit outcomes in the hypotheses. This included, for instance, the increased or improved use of learning spaces within the institution (Beagle et al., 2006) in H8-4 and H9-4 and the growing diversity and complexity of questions from users requesting better support services (Wong, 2010) in H9-3. Finally, the benefit outcomes reflected some of the expected results that Learning Commons planners and information literacy instructors would like to achieve, ranging from instant savings of student time and effort to the educational aims of the institution. Three to six items were developed for each first-order construct to ensure reliability through sufficient coverage of the constructs' theoretical domain (Hair, Ringle, & Sarstedt, 2011).

Prior to full-scale data collection, a pilot study was conducted with 34 students recruited from the users of Facilities A and B. Advice was also sought from professional librarians in the HKU Libraries to identify inadequacies in the research instrument, check the participants' understanding of the survey questions, and test the validity and reliability of the survey instrument. Some modifications were made to the final questionnaire, taking feedback from the pilot survey into consideration. The survey also included basic demographic questions (see Online Appendix[1]).

Findings

Out of 388 participants, 69% were Hong Kong students, and 66% were female. Of the 31% of non-local students, around two-thirds of the non-local students were from mainland China, and the remaining were from other countries. The distribution of undergraduate, master, doctoral, and post-doctoral students were 76%, 17%, 6%, and 1%, respectively, representing a variety of disciplines consistent with the general HKU student population.

Table 1 presents the use frequency (1–never, 2–a few times each year, 3–monthly, 4–weekly, 5–two to a few times each week, 6–daily) and correlations between the different types of the Learning Commons facilities use. For all except one pair, moderate correlations were observed. This suggests that many students used the Learning Commons facilities together.

Table 2 shows the reliability of all of the reflectively measured constructs. Because the Cronbach's Alpha, composite reliability, and average variance extracted (AVE) measures exceeded 0.7, 0.7, and 0.5, respectively, an acceptable level of reliability was assured.

Fig. 2 shows the structural model.

To confirm that the positive outcomes result from the students' exposure to and use of the Learning Commons, two tests were conducted. In the first test, the extent of use variable was created by averaging each student's scores on all items presented in Table 1 (frequency of the use of the Learning Commons facilities). It was found that use frequency was positively correlated with psychological ($r = 0.21$, $p < 0.001$), behavioral ($r = 0.30$, $p < 0.001$), and benefit ($r = 0.28$, $p < 0.001$) outcomes. Thus, students who used the facilities more often achieved more positive outcomes. In the second test, use frequency was added to the model as a moderator of the relationship between psychological and behavioral outcomes. The rationale was that to achieve behavioral outcomes resulting from changes in the psychological outcomes, the student had to actually visit and use the Learning Commons facilities. A strong, positive moderation effect ($\beta = 0.52$, $p < 0.005$) further confirmed that changes in behavior resulting from improvement in one's psychological state were dramatically amplified when one made use of the Learning Commons.

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[1] Available at http://aserenko.com/LC_Survey.pdf

The results demonstrate the following. First, expectation disconfirmation was positively associated with perceived quality and satisfaction. Perceived quality also leads to satisfaction. By following the recommendations of Hair, Hult, Ringle, and Sarstedt (2014), a mediation analysis was carried out in which perceived quality was positioned as a partial mediator of the expectation disconfirmation-satisfaction relationship. It was concluded that perceived quality was a partial mediator that mediated the relationship between expectation disconfirmation and satisfaction. The total effect of expectation disconfirmation on satisfaction was 0.76 ($0.69 \times 0.34 + 0.53$), and the 65% variance explained in the satisfaction construct would be considered high in social science research (Cohen, 1992).

Second, psychological outcomes affected behavioral outcomes, which in turn produced a number of benefits. This shows that students' cognitive changes could alter their behaviors, resulting in positive consequences, which is the goal of the Learning Commons. Third, the effect of satisfaction on psychological outcomes was higher than that of perceived quality. Fourth, out of the five psychological outcomes included in this study's model, increased virtual learning environment self-efficacy and improved perceptions of virtual learning environment were the most salient. Improved perceptions of the value of other informal learning spaces and improved perceptions of the facility personnel's helpfulness were less important. Fifth, among the behavioral outcomes, the most significant pertained to improved and increased use of other informal learning spaces, whereas increased use of the virtual learning environment was the least important factor. Sixth, all of the benefit outcomes exhibited minor differences in their importance, demonstrating the relative equality of their contributions.

One of the limitations of quantitative inquiry methods is that they cannot fully support causality among the tested relationships. In this study, the key assumption tested was that the positive benefit outcomes (time savings, effort reduction, grades and coursework benefits, collaborative problem solving skills improvement, and improved learning outcomes) resulted from the students' use of the Learning Commons. To verify the above causality, a qualitative follow-up study was conducted. Fifty-two online survey participants agreed to answer a small set of open-ended questions, and their answers were tape-recorded and transcribed. Specifically, they were asked to describe the reasons why they visited the Learning Commons, the impact of these facilities on their academic and social life, and the development of relevant academic and information technology skills.

First, the respondents confirmed that the use of the Learning Commons helped them achieve substantial time savings and reduce the amount of effort they needed to exert in school-related matters. Specifically, some students emphasized their easy access to the virtual environment, such as the online library, easy-to-use information search facilities, and printing services:

> "The speedy and big computers will facilitate my information search. Quicker access to the web will lead to a better mood. And because there is no connection breakdown with the WiFi when using the desktop computers provided by the University."

> "I think the impacts are mainly on my academic and social life. Academically, the space offer convenience in doing my work and searching information."

Second, due to the use of the Learning Commons, students achieved effectiveness gains in the form of higher grades and coursework impact:

> "Academically, there will be some impact. For example, if I have no time [to work here] and need to work at home, the quality and quantity of my work will be lower."

> "I think there is definitely a big impact academically with such a good environment."

> "Most often I engage in my assignment and research…search information or do assignments…my coursework benefits a lot."

Table 1

Learning Commons use – the correlations table (all values are significant at $p < 0.05$ unless indicated otherwise).

	Use frequency	1	2	3	4	5	6	7	8	9
CWLC – Quiet study rooms (1)	2.42	1.00								
CWLC – Group study rooms (2)	2.72	0.37	1.00							
CWLC – Computer workstations (3)	3.48	0.20	0.29	1.00						
CWLC – Student advisory services zone (4)	1.88	0.43	0.45	0.29	1.00					
CWLC – Other areas (5)	3.42	0.19	0.39	0.43	0.29	1.00				
Level 3 – Quiet study rooms (6)	2.15	0.52	0.28	0.07 (ns)	0.38	0.13	1.00			
Level 3 – Group discussion rooms (7)	2.60	0.31	0.52	0.13	0.39	0.21	0.47	1.00		
Level 3 – Computer workstations (8)	2.87	0.18	0.16	0.40	0.21	0.20	0.33	0.37	1.00	
Level 3 – Information counter (9)	2.15	0.35	0.37	0.24	0.46	0.24	0.45	0.47	0.52	1.00
Level 3 – Other areas (10)	3.23	0.17	0.15	0.14	0.22	0.37	0.31	0.42	0.43	0.42

Table 2

Assessment of the measurement model.

Construct	Cronbach's Alpha	Composite reliability	Average variance extracted
Expectation disconfirmation	0.83	0.90	0.75
Perceived quality	0.84	0.91	0.76
Satisfaction	0.88	0.93	0.81
Decreased virtual learning environment anxiety	0.91	0.94	0.84
Increased virtual learning environment self-efficacy	0.95	0.97	0.90
Improved perceptions of virtual learning environment	0.91	0.95	0.85
Improved perceptions of the value of other informal learning spaces	0.93	0.96	0.88
Improved perceptions of facility personnel's helpfulness	0.95	0.97	0.91
Increased use of virtual learning environment	0.72	0.83	0.56
Increased use of facility personnel's services	0.93	0.96	0.88
Improved use of facility personnel's services	0.89	0.93	0.83
Increased use of other informal learning spaces	0.95	0.97	0.91
Improved use of other informal learning spaces	0.87	0.92	0.80
Efficiency gains in form of time savings	0.93	0.95	0.87
Efficiency gains in form of effort reduction	0.87	0.92	0.80
Effectiveness gains in form of grades and coursework benefits	0.93	0.95	0.87
Effectiveness gains in form of collaborative problem solving skills improvement	0.94	0.96	0.89
Improved learning outcomes	0.93	0.94	0.73

Third, students were able to improve their collaborative problem solving skills:

"Sometimes, students need to present their paper in a seminar and they will ask fellow students to come and do a mock presentation, and we will try to act as professors and ask questions. And he/she will try to respond and think about, and really if in the seminar someone does ask him/her, how she'll respond, it's very helpful for him/her."

Fourth, the Learning Commons had a very strong positive effect on various improved learning outcomes. Some students were able to pursue academic and professional excellence:

"I find learning in [Facilities A & B] is a big part of my life. Because I couldn't study at home so most of the time I stay on campus."

"I know some university debate team members. They always hang around at [Chi Wah Learning Commons] and reserve a room there for meetings…I have learnt a lot of things [that are] beyond my academic pursuit but are helpful to my life and learning."

In response to questions on how the Learning Commons technological support influenced their learning, the following answer reflected the promising impact:

"I think we have booked the room for our own use, so we'd have to pick up some skills like connecting devices in the room, those thing we'd do more frequently. Because no one would help you and we wouldn't want to go bother the staff, so we've learned those skills."

Students were able to cultivate a sense of intercultural understanding:

"So you kind of have people from all different ends of the world, and they have their own religions, they have their political opinions, personal values I do talk with them. Normally these discussions if they happen on campus, it's normally in Level 3…, it's not very different from the library, because it's all open space, but the thing is the small corner feels like there's more privacy."

Some reported improvement in their communication skills:

"Actually with this kind of spaces, our communicative skills would improve. In this kind of environment, we know we need to have certain attitude or work to do. Outside these spaces, some students may talk or behave more casually. They may easily shift to other topics."

Overall, all of the comments were very affirmative, and they further supported the positive impact of the Learning Commons on various benefit outcomes.

Conclusion

Based on the findings, several theoretical and practical insights are worth elaborating on. First, this study confirmed the nomological validity of EDT and showed that although EDT originated in the marketing discipline, it can be applied to the field of education to investigate how the Learning Commons influence student cognition and behaviors and produce various benefits. The analysis revealed a strong association between expectation disconfirmation and student satisfaction, which was partially mediated through perceived quality, with a total effect of $\beta = 0.76$. Thus, consistent with EDT, it can be concluded that students form prior expectations of their university's Learning Commons before they actually experience them. Over time, they
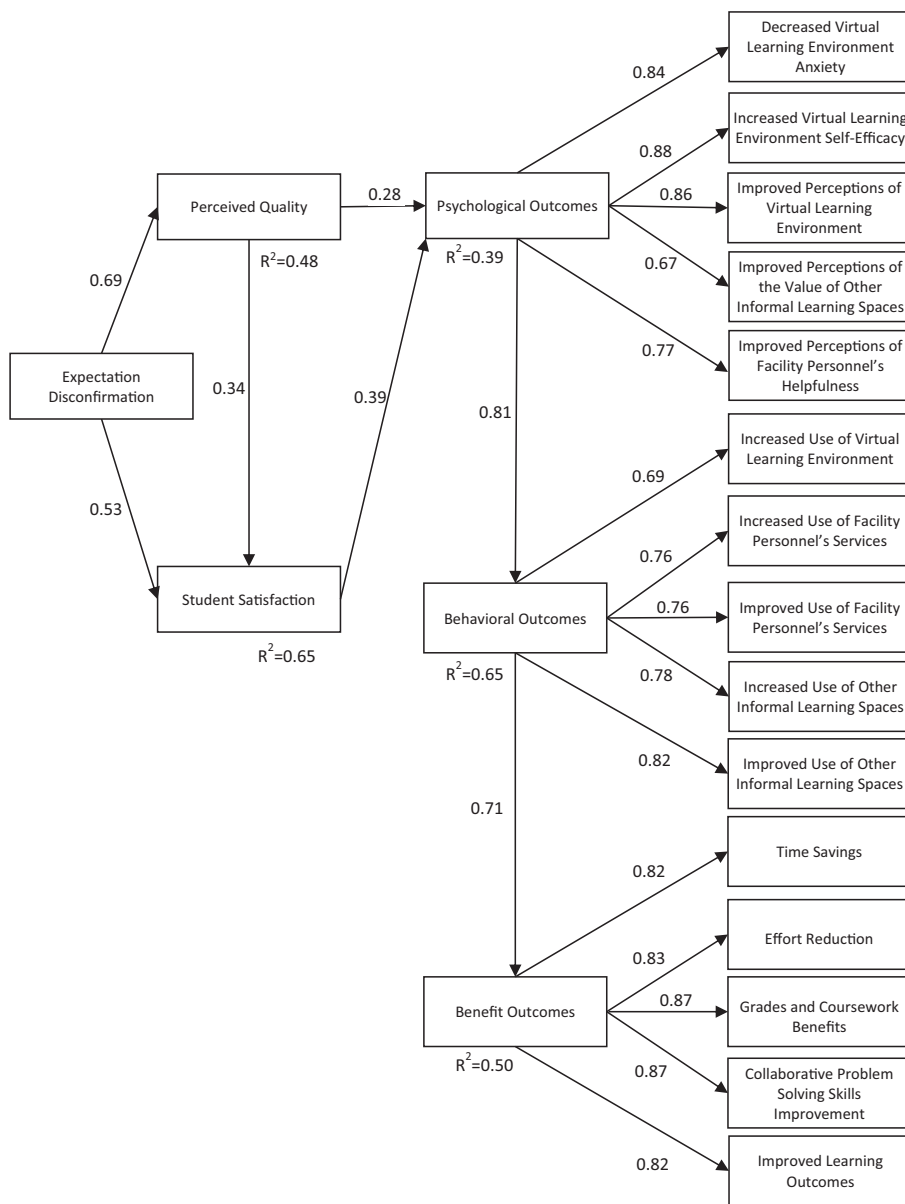
Fig. 2. The structural model (all relationships are significant at $p < 0.001$).

gradually develop their actual perceptions of the Learning Commons services. When students believe that their Learning Commons meet or exceed their initial expectations, their perceptions of the spaces' quality become more positive and their satisfaction is also enhanced. In contrast, if their actual Learning Commons experience falls short of their prior expectations, they perceive the Learning Commons as being of low quality and become dissatisfied with them. It can be concluded that effective maintenance of students' perceived quality of the Learning Commons helps to fulfill or even enhance their level of satisfaction. Learning Commons management should therefore pay due attention to the upkeep and quality of their services and facilities. In addition, it is critical not to overstate the actual benefits of the Learning Commons facilities to ensure that students do not develop unrealistically high prior expectations and later become disappointed with their experience.

Second, the effect of perceived quality on psychological outcomes was partially mediated through student satisfaction, with a total effect of $\beta = 0.41$ (i.e., $0.28 + 0.34 \times 0.39$). This suggests that even though quality perceptions may directly change cognitive processes of students based on their experience with the Learning Commons, it also determines their level of satisfaction, which in turn influences their

cognition. Thus, university administrators responsible for the development of Learning Commons initiatives should focus on both the quality of their Learning Commons and the level of student satisfaction (Tan & Kek, 2004). Third, the results suggest that psychological outcomes lead to behavioral outcomes, which then produce benefit outcomes. It also shows the importance of monitoring students' perceptions of the Learning Commons that has been reported previously (Marchand, Nardi, Reynolds, & Pamoukov, 2014). University administrators should thus direct efforts to the improvement of students' perceptions of the Learning Commons, which will eventually lead to various benefits valued by their students.

Fourth, the increased virtual learning environment self-efficacy and improved perceptions of the virtual learning environment were the key psychological outcomes. A strong sense of efficacy has long been viewed as a key contributor to personal accomplishment. Successful acquisition of basic academic skills boosts scholarly self-efficacy and serves as a foundation for the fulfillment of vocational roles in adulthood. Fifth, among the behavioral outcomes, the most significant ones pertained to the improved and increased use of other informal learning spaces. In the case of HKU, many Learning Commons-related initiatives

have been introduced since the implementation of the new four-year curriculum in 2012 (Sidorko & Fox, 2013). Numerous spaces for casual studies or informal discussions have been arranged outside large lecture theatres and clusters of classrooms. Such spaces include furniture, power sockets, and Wi-Fi coverage. It is not unusual to observe students occupying these spaces for learning-related activities between and after classes. Sixth, all benefit outcomes exhibited minor differences in terms of their importance, demonstrating the relative equality of their contribution. The results confirm that students save time and improve their grades because they can easily find the needed resources, have a space to study, discuss course material, and receive help through the Learning Commons. As many of the comments attested, the Learning Commons helped them become more effective and efficient in their studies and achieve various learning outcomes, including the cultivation of academic and professional excellence, a sense of intercultural understanding, and communication skills.

Despite the potential contribution of this study, there are several limitations that must be mentioned. First, although the quantitative nature of this research helped to identify the cognitive and behavioral changes exhibited by students because of their Learning Commons use, it did not explicate why these changes occurred. A follow-up qualitative methodology was used to better understand the phenomena taking place from the students' perspective. Nevertheless, a large-scale qualitative study is further warranted to explore other possible outcomes and

their underlying causes. Second, although the site of this study was novel and under-studied (i.e., Hong Kong), the model should be re-validated in other parts of the world to demonstrate its generalizability. Third, this study was conducted in a research-intensive university where most students are required to heavily utilize online library resources, collaborate with their peers, and work with their supervisors, for which they must have access to physical spaces, such as the Learning Commons. However, it would be interesting to see how the model tested in this study would change in the context of a teaching-focused university, where students have different needs and priorities. Fourth, the benefit impacts measured in this study were self-reported. Future researchers may operationalize the benefit outcome constructs with objective measures. For instance, students' grades may be obtained directly from their transcripts, and students can be asked to maintain a log on the amount of time they save with the help of the Learning Commons.

The robust development of the Learning Commons on university campuses offers various opportunities to apply this study's model in other fields, such as university museums and makerspaces. Other management, psychology, and education theories could also be applied in the context of the Learning Commons to further assess their potential contributions. Future researchers may also be interested in comparative studies of institutions in different regions to understand the impact of cultural, ethnic, or subject background differences.

Appendix 1

Provisions and capacity of Chi Wah and Level 3 Learning Commons.

Facility	Provision
CWLC - Quiet Study Rooms	Study tables and sofas
CWLC - Group Study Rooms	Display panels for notebook projection, video camcorders available for loan
CWLC - Computer Workstations	Desktop all-in-one PCs and Macintosh workstations connected to printers and scanners
CWLC - Student Advisory Services Zone	Open meeting space, rooms for consultation sessions and workshops held by units in charge of student affairs, English studies and academic advisory services
CWLC - Other areas	Study tables and sofas for individuals and groups, copiers, 3D printers and two service counters manned by IT and library staff
Level 3 - Quiet Study Room	Study tables
Level 3 - Group Discussion Rooms	Electronic and manual whiteboards, notebooks connected to short throw projectors
Level 3 - Computer Workstations	PC workstations connected to printers and scanners
Level 3 - Information Counter	Two to three library staff who provide advice on various information literacy issues
Level 3 - Other areas	Tables, carrels and sofas for individuals and groups, printers, copiers, express scanners, touch screen computers, and open tables for group work

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