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A Win-Win Faculty–Student Collaboration: Exploring An Undergraduate Research-Type Service-Learning under COVID-19

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Implementing undergraduate (UG) research in service-learning can facilitate scholarship for faculty members and enhance student developmental outcomes. This study proposes a conceptual framework with a multi-stakeholder approach integrating faculty research initiatives in research-type service-learning projects based on self-determination theory. The model comprises a focused research project, a dedicated research team, institutional supportive infrastructure, a discrete focus on the project, and an emphasis on academic and community impacts. As a result, different stakeholders can achieve benefits, including students, faculty members, and community partners. Benefits include better research skills for students, progress on faculty research initiatives, new insights and ideas for community partners, and facilitation of community development. The study evaluated the model with a Hong Kong university service-learning course, which was forced to move online due to the COVID-19 outbreak. The evaluation employed in-depth individual interviews with the course instructor, service-learning coordinators, and community partners, and a focus group interview with students. The results showed that, with adequate training in research skills and support for students, research-type service-learning projects could generate quality research outputs, support faculty scholarship, and create community impacts. Moreover, students gain developmental outcomes and acquire research skills and experience.

Keywords: research-type service-learning, undergraduate, training in research skills, student developmental outcomes, faculty scholarship, community impact

INTRODUCTION

Service-learning is "a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development" (Jacoby, 1996, p. 5). Past literature has shown that all stakeholders, including students, community partners, the community, faculty members, and educational institutions, can gain from service-learning (Clarke, 2003; Eyler et al., 2001; Lau & Snell, 2020; Seigel, 1997; Snell & Lau, 2020).

Despite the benefits and rapid growth of service-learning, its adoption in Hong Kong universities has never been as easy as it might have been. One major obstacle has been persuading faculty members to invest extra time and effort in service-learning. For decades, promotion and tenure for faculty members have been primarily based on research excellence and publications rather than teaching and service (Green, 2008; Reardon, 1994; Schimanski & Alperin, 2018). As a pedagogy that requires time to be devoted to teaching and service, service-learning seems to be a burden, rather than an attraction, to faculty members. For example, Ma and Law's (2019) faculty engagement study revealed that the limited impact of service-learning on faculty research and professional development has been among the top barriers to faculty engagement with it.

Research is by no means new in service-learning. In research-type service-learning, students receive training in research skills and implement research studies for community partners on various topics. As a result, students can develop essential capabilities for performing research, such as problem-solving and critical thinking (Chan et al., 2009). Other studies have found that training in research skills helps students develop communication and cognitive skills and improve their chance of postgraduate study (Woolf, 2014). Many of these skills are important university graduate attributes, in high demand among employers, and currently valued in the job market (Burning Glass Technologies, 2015; Chan, 2012; Murtonen & Lehtinen, 2005).

Research-type service-learning also greatly benefits faculty members by providing excellent opportunities to materialize faculty research initiatives in the community, with trained students offering additional workforce. In this view, research can be an excellent service-learning element that benefits all stakeholders and motivates faculty members to engage with this pedagogy.

Therefore, this study proposes and evaluates a model of integrating faculty research studies into service-learning. This paper comprises two parts. The first part reviews the prior relevant literature to develop the model, while the second part evaluates the model through a Hong Kong university service-learning course.

MODEL DEVELOPMENT

Integrating Training in Research Skills into Service-Learning

Although the benefits of training undergraduate (UG) students in research skills are manifest (Reardon, 1994), studies of integrating service-learning and training in research skills nonetheless remain limited. The earliest example identified was an article by Reardon (1994), which presented two participatory action research projects conducted by UG students in service-learning courses. The projects achieved significant community impact, the students gained various learning outcomes, and the importance of planning with and in connection to the community in designing service-learning was recognized. In another article, Peterson and Schaffer (1999) shared how to develop research skills with service-learning projects, in which students received training in research skills before engaging in research projects for community partners. The evaluation showed that students had enjoyed the research process and that the projects had enabled them to develop their research interests by exposing them to experience. However, attention was needed about managing stakeholders' expectations.

Keyton (2001) also illustrated how service-learning could be implemented by integrating applied communication research and training in research methods. The model for teaching research methods was developed, with several prerequisites, and some key success factors were identified. The case studies demonstrated that the growth in research capacity and other learning outcomes for students were more significant than their expectations. Lastly, Machtmes et al. (2009) reported on how to teach qualitative research methods to graduate students through problem-based service-learning, which led to various benefits for students. The research project also generated operational benefits for the community partner, which developed insights by working with the prestigious university partner.

Table 1 summarizes the benefits and key success factors revealed by the

above literature review. To conclude, students can draw extensive benefits from research-type service-learning. These include learning research skills, gaining research experience, developing professional perspectives and a passion for research, acquiring community knowledge, caring for the community, and having a sense of achievement. Moreover, research-type service-learning can impact the community by influencing social and economic development policies, providing information and insights for community partners and letting the latter establish ties with academia. The key success factors include a realistic research scope and duration, considering community needs in design, sufficient preparation and training, and a joint commitment among all stakeholders.

Table 1

The Benefits and Key Success Factors of Integrating Training in Research Skills into Service-Learning

Study	Benefits	Key Factors to Success
Reardon (1994)	**To students:** ■ Gaining firsthand community knowledge ■ Deeper understanding of social/political dynamics ■ Applying knowledge in real situations ■ Acquiring new knowledge and skills ■ Developing as self-directed problem solvers ■ Higher level of self-confidence **To the community/community partners:** ■ Affecting economic development ■ Influencing government policies	■ Managing research scope realistically according to time and resources available to students ■ Linking research and planning efforts to the community situation and development ■ Designing projects that students and faculty members can work on for a long time (e.g., several semesters) ■ Structuring service-learning projects with sufficient time for community engagement
Peterson & Schaffer (1999)	**To students:** ■ Acquiring research knowledge and skills ■ Developing an interest in research ■ Witnessing the power of research	■ Demonstrating a clear relationship between service-learning and research to students beforehand ■ Assistance with research tasks (e.g., literature review) ■ Quality assurance over work quality ■ Communication among stakeholders on managing expectations ■ Stakeholder dedication ■ Longer project period

Keyton (2001)	**To students:** ▪ Applying research knowledge ▪ Witnessing research as a meaningful tool to solve real-life problems ▪ Deeper understanding of the community ▪ Impacting the community (e.g., on policy and procedural decisions) ▪ More and continual reflection on the research process **To the community/community partners:** ▪ Creating impacts on policy and procedural decisions	▪ Research courses have to be experientially based to allow students to experience all steps in a research project ▪ Research projects have an applied nature ▪ Feasible within reasonable timeline and students' abilities ▪ Ensuring a joint student-faculty commitment
Machtmes et al. (2009)	**To students:** ▪ Gaining qualitative research experience ▪ Changing the impression of qualitative research ▪ Development of community of practice ▪ Professional development by research practice **To the community/community partners:** ▪ Providing useful information for program development and management purposes ▪ Extra manpower to assist the community partner's service ▪ Access to prestigious university partners ▪ Linking practice with theory	

Integrating Faculty Research Projects into Undergraduate Training in Research Skills

The first relevant study integrating service-learning into faculty community-based research was carried out by Marston and Nelson (2014), who reported on students engaging in a service-learning project by interviewing refugee migrants, followed by critical reflection. This project was part of broader faculty research. The community partner offered an information session to support the project, and the instructors provided training to the students on interview etiquette and professionalism. As a result, professional and scholarly analyses

were shared with the community, and students experienced transformative learning through participating in research. On the other hand, the instructors underscored the importance of institutional support and resources, careful planning, and collaboration with community partners.

A second study, conducted by Koehler et al. (2015), translated the projects of faculty-student research collaboration into a model consisting of three phases. The middle process phase is collaborative research by faculty members and UG students. The preceding phase focuses on various requirements, including a dedicated research team, a focused research program, a discrete focus on student projects, supportive infrastructure, high academic standards, and result dissemination. As a result, different benefits can be achieved for stakeholders. Students can enhance their research skills, develop professional perspectives, gain a sense of achievement, and cultivate a passion for research. Faculty members, meanwhile, can make research progress while polishing their research supervision skills.

The above model is highly relevant, and the author argues that it can be applied in the research-type service-learning context with the following modifications. First, the author removes the required component of accepting students with high academic standards into a faculty-student research collaboration because this is not congruent with the service-learning principle of educating students from different backgrounds and academic abilities. Second, community impacts are added to the emphasis on the impacts, as these are also important outcomes of service-learning (Cruz & Giles, 2000; Driscoll et al., 1996; Snell & Lau, 2021).

Third, the author suggests including partner organization representatives of community partners in the dedicated research team, given their indispensable roles in service-learning (Eyler & Giles, 1999; Holland & Gelmon, 1998; Jacoby, 2003; McCathy et al., 2002; Wade, 1997) to achieve student developmental outcomes and successfully implement service-learning projects. Such representatives should play an active role in every stage of the research project, including formulating research topics and supporting research implementation (e.g., providing access to the studied population, involvement in data analysis to ensure the findings are useful, and assisting in results dissemination to maximize community impact). As a result, their participation can ensure that service-learning projects respond to real community needs.

Fourth, community partners should also put a discrete focus on service-

learning projects so that students and instructors can consider the views and constraints of the community in research design and execution. Fifth, the model should include the community-related benefits presented in Table 1. As Keyton (2001) concludes, "it is impossible [for students] to report research results without talking about the students' community, its social service needs, and agency successes and failures" (p. 209). Students can gain community knowledge through research, such as challenges faced by disadvantaged groups and the social dynamic of the community. Moreover, students' level of civic orientation and, therefore, engagement can be enhanced through service-learning (Bringle & Clayton, 2012; Richard et al., 2017).

Sixth, research-type service-learning projects establish an ideal context for students to perform continual reflection, as a key foundation and benefit of service-learning (Godfrey et al., 2005). Seventh, a separate category focusing on the impacts on community partners and the community is created in response to the findings revealed in Table 1 and other studies (such as Lau et al., 2021; Lau & Snell, 2020). In summary, the model should accentuate more of the community elements and impacts.

Apart from incorporating the reference to the original model by Koehler et al. (2015), the model proposed above is also guided by human motivation and personality theories, particularly self-determination theory (SDT). SDT theory assumes that people are inclined toward psychological growth and learning when three basic psychological needs are supported: autonomy, competence, and relatedness. Fulfilling these needs is key to success in teaching and learning. In the educational context, SDT argues that more autonomous and intrinsic motivation (such as students' inherent interest, enjoyment, and sense of value) results in students' engagement and learning. Well-structured learning atmospheres conducive to optimal challenges, constructive feedback, and growth opportunities can develop one's competence. Good relatedness between faculty members and students will lead to higher engagement on both sides, resulting in better learning outcomes. In a similar vein, if faculty members can fulfill the above needs, they can also enhance teaching engagement and outcomes (Ryan & Deci, 2020).

In this light, the faculty–student collaboration in research-type service-learning provides an excellent platform for both faculty members and students to fulfill these psychological needs to achieve better teaching and learning outcomes. The model advocates a dedicated research team with a supportive

infrastructure and a discrete focus for service-learning projects, establishing a well-structured and conducive learning environment to ensure a high level of participation for all stakeholders on that competence concerning the feeling of mastery develops. The focus research program considers faculty interests, student capabilities, and community needs and situations, further enhancing intrinsic motivation and autonomy for all collaborating stakeholders. The emphasis on community impact and as academic achievement, provides values to and motivates all stakeholders to work for the public good together. During project implementation, frequent interaction between stakeholders can enhance their degree of relatedness, particularly between faculty members and students, further facilitating teaching and learning.

To conclude, SDT underpins the proposed model. The community elements as a requirement are attenuated on the roles of community partners in preparation and implementation. Finally, community impact is underscored as the outcome in the model. The second part of this paper evaluates the model through a pilot service-learning course and reports the results.

Figure 1

The Proposed Model of Integrating Faculty Research into Research-type Service-Learning
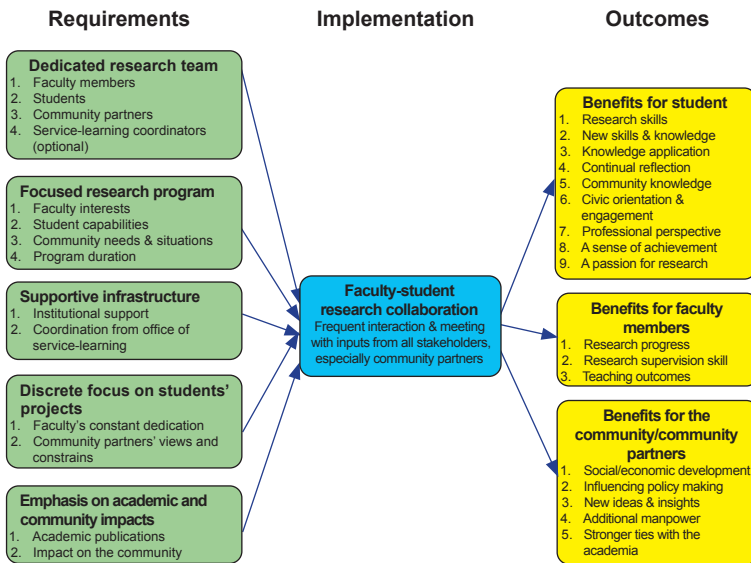
EVALUATING THE PROPOSED MODEL
WITH A SERVICE- LEARNING COURSE

The Service-Learning Course

The course used for evaluating the model was "Leadership and Teamwork" (hereafter "the tested course") from the Faculty of Business of Lingnan University, taught in the fall semester of 2020. Most students in the tested course studied business and had little background or training in research. A total of 32 students were enrolled, and six groups were formed on different service-learning projects, of which four groups engaged in direct community services. The other two groups, with a total of 12 students (hereafter "the research students") engaged in a research-type service-learning project (hereafter "the research project").

Due to the COVID-19 outbreak, the instructor (who played the role of the faculty member in the model) taught the course online. Moreover, she led the two research project teams. In the research project, students needed to transcribe, code, and analyze data provided by the instructor, obtained from her ongoing work-from-home (WFH) research study, and report findings on how the WFH mode impacted work performance and learning outcomes in a summer internship. Students were given extensive training in qualitative research skills and methods beforehand and applied them when carrying out the research.

The deliverables included interview-coding tables and infographics in conveying the research findings to the public. Given the project's short duration (13 weeks) and the fact that the students were inexperienced and unskilled in research, the instructor collaborated in the analysis and reporting stage to enhance student learning outcomes and output quality. Moreover, as the supporting unit, the Office of Service-Learning (OSL) of Lingnan University arranged a two-hour lecture on qualitative research skills and methods. During implementation, two research associates of the faculty research team met with the students regularly (weekly or fortnightly) to discuss progress and provide advice. Two milestones were set: 1) the interim presentation on research findings and how to publicize them, and 2) the final presentation on infographics and reflection on what they had learned during the research project.

Apart from the research students, the research project involved two more stakeholders. The first was the OSL, which served as both a community partner and supporting infrastructure. The OSL engaged in the former role because its staff members were interested in designing and implementing summer service-learning internships with the WFH mode. Regarding the second role, two staff members were assigned as coordinators to assist the instructor and support project implementation. The second stakeholder was the faculty research team, comprising the instructor and two research associates responsible for training in research skills, supervision, and consultation.

Model Evaluation

The evaluation aimed to test the extent to which the model can be applied in a research-type service-learning project in terms of requirements, implementation, and outcomes by employing qualitative research methods to collect different stakeholders' feedback. The author interviewed the instructor, the OSL coordinators, and the community partner. A focus group was also conducted with five of the students randomly invited from the two research project groups (12 students); students from both groups were included to ensure their opinions were represented. Using Zoom, the author conducted the interviews and focus groups, with the former lasting around 30 minutes and the latter around 1.5 hours. Prior consent was obtained from all the interviewees. The interviews and focus group were audio recorded with the interviewees' consent and followed a pre-designed protocol. Specifically, the protocol included questions about the preparation for and implementation of the research project, challenges faced in the process, benefits gained, and room for improvement. The interview and focus group records were transcribed and coded by a research assistant. The author analyzed the coding data and used a constant comparative method to identify and categorize themes and patterns according to similarities and differences (Merriam, 2009). The themes and patterns were then compared against the model. Apart from the interviews and focus groups, the author also examined the research outputs generated by the research project.

Findings

Measures for Preparation and Implementation. One major measure within the preparation and implementation undertaken by the instructor and OSL coordinators was illustrating to the research students how the research project could generate community impact and learning outcomes. This measure was necessary because the value of the research project lay in its community impact; thus, students were intrinsically motivated to engage and achieve in it, according to SDT. For example, the instructor used the extra time to elaborate on the meaning and potential benefits of the research project:

> "They [the research students] knew there were benefits, yet did not understand what exactly they were… So, I needed to brief them on the purpose."

The OSL coordinators had also noticed the necessity of motivating the research students by illuminating the community impact and learning benefits for them:

> In preparation… we focused on explaining to the [research] students about how the deliverables were meaningful to the public, and created a community impact… [the research students] were not just helping the professor as research assistants without gaining any benefits themselves.

Challenges Faced in the Process. The problem of connecting the research project and community impact was also seen inside the OSL. In preparation, there was a debate among OSL staff members on whether the research project should be regarded as service-learning, given its community impact could not be explicitly illustrated:

> "The main challenge was to decide whether this research project could be regarded as service-learning at the beginning."

This point was crucial, because unmotivated staff members, who have

no sense of ownership of the research project, cannot motivate students to engage. To resolve this issue, the instructor discussed and clarified it with OSL staff members to gain their support.

Another challenge to the OSL was providing training in research skills. Good training can equip inexperienced students with the necessary skills and knowledge to undertake the research project. A coordinator admitted that they would not have considered the research project without support and training from professional research team members:

> "If [the research team had not been] professional, we would have hesitated to collaborate with them on this project."

> "Some training in research skills required professional experts and was beyond the OSL's abilities."

For the instructor, the challenge came from the university regulation that course instructors can only teach, thereby restricting her engagement in the research project:

> "I could not be involved [in the research project]. In this course, I was the one teaching leadership and teamwork; I could only input into the project from this perspective."

To offset the negative consequences caused by the above restriction, the instructor had to rely on the research team members for support:

> "The other tutors [from the research team] were able to guide and support [the research students]."

For the research students, the major challenges occurred in implementation. As most of them had no prior research background, they found it challenging to manage the coding task, even after receiving training:

> "I thought the teamwork on deriving the coding table was quite difficult."

The workload and short project duration were other challenges exaggerated by online communication in the virtual learning environment:

> "The workload for this research project was really heavy, within a pressing timeline... and the online mode made our collaboration much more difficult."

Benefits Gained. *Faculty Scholarship.* The research project generated salient research outputs. Upon completion, the research team saved over 150 hours transcribing the interview clips and coding, which spared more time for the analysis and publication process. Moreover, the students' input accelerated the research progress. The raw data had been translated into one presentation at an academic conference, one journal paper under review, and one paper under development within three months.

Community Impact. As the community partner, the OSL recognized the community impact created by the research students' infographics, even though they were indirect and delayed. The OSL found the research findings useful in engaging other potential internship partners utilizing the WFH mode in the future:

> "[The findings] can help us plan, and they provide information when engaging internship organizations…so we can better manage the internship."

This view was shared by the instructor:

> "Some internship organizations have no money for research, yet they want to know how [the WFH mode] affected them. I think… if we release [the findings], they would be interested in knowing more."

The students were also aware of the community impact that they had created but were concerned about how to further leverage it:

> "I think there was a community impact, but I am dubious about the degree."

"I think the promotional channel [of putting infographics onto the university website] was a bit passive."

Student Learning Outcomes. All interviewees agreed that the research project was a very valuable experience for the research students. Benefits mentioned by the research students included learning research skills, applying knowledge, developing a professional perspective, personal growth, and a sense of achievement:

"I am very happy that I was able to learn these [research] skills."

"I never expected that I needed to do an infographic [and use my marketing skills] in a human resources management course."

"I think through working online, I have learned how to establish relationships and engage someone I did not know toward a common goal."

"[I learned] that doing research has to be very meticulous... and how to be professional in uncovering essential results through data analysis."

"When I saw that we finally finished a neat infographic after a few days' work, I felt a sense of achievement."

"I understood more about the leadership taught by the professor... and practiced that in the project."

Benefits for the OSL Coordinators. Interestingly, a benefit for the OSL staff members and coordinators was that the research project inspired them to revisit the meaning of service-learning and how research connects with community impact. The coordinators shared that this positive project experience opened up more possibilities for them in future service-learning design:

"I think [this experience] let me see a lot of possibilities in service-learning design."

Room for Improvement. Several areas of improvement were identified. First, the OSL coordinators wanted to expose students to a more complete research cycle:

> "Could students be involved more in the future?... I understand two months are very short, but it would be better if students could… learn the entire research process."

The instructor commented that the research project would have achieved more if they had been able to hold face-to-face meetings, as she found it hard to monitor the research students' work online:

> "The teacher could not see [how the research students came up with the coding categories], and this might create problems in the process... it would have been better if there had been more face-to-face meetings."

Moreover, the community partner pointed out that integrating the two groups' analysis results would be more useful.

> "I think it would be better if we…combine the two groups' results... as that is more useful and more complete."

The community partner also suggested supervising both groups together to save workforce and time.

> "If supervised [the two groups] together, manpower and time could be saved."

The research students' principal recommendations included workload, task structure, and course design. They would have preferred a more succinct design to avoid doing similar tasks multiple times:

> "[The assessment was] duplicated in many parts...and could be simplified."

Retention and Recommendation. The instructors, the OSL coordinators, and the community partner all saw this research project as a success and would engage in it again or recommend it to others:

> "If there are opportunities in the future, I [the instructor] will do it again…and OSL should have more research-type service-learning projects like this one by extending it to other subjects."

> "Of course, I [the OSL coordinator] am willing to do it again… I think both OSL and the university want to promote more training in research skills to undergraduate students…and let them acquire more research experience."

> "I [the community partner] would recommend this to other organizations."

After the research project, the research students had not developed a very keen passion for research. This lukewarm attitude may have been caused by the heavy workload and high demand for quality. Nonetheless, they maintained a positive view toward research and appreciated its merits. They claimed that they would engage in research again if necessary and recommend it to others:

> "If research can bring benefits to my work, I will do it."

> "If my fellow classmates want to learn research skills, I will recommend this course to them."

CONCLUSIONS

This paper proposes a faculty–student research collaboration model by integrating faculty research into training UGs in research skills via research-type service-learning, underpinned by SDT and built on the model developed by Koehler et al. (2015). The three phases of the model emphasize the inputs required by collaborative implementation taken by and benefits created for different stakeholders. The requirements and collaborative implementation

establish the foundation to fulfill the three basic psychological needs in SDT, namely autonomy, competence, and relatedness, for positive teaching and learning outcomes.

The model was evaluated in a service-learning course, in which students performed a research-type service-learning project and achieved the research and publicity outputs of the high value expected by the instructor. Although the instructor did not state the benefits concerning teaching and research supervision skills, she did reflect on the challenges she had faced and suggested possible solutions. Speeding up the research progress with tangible outputs has met the instructor's research interests. The author believes that the benefits mentioned above can be attributed to the instructor's intrinsic motivation in the research project to achieve better teaching and research performance. Moreover, the community partner received the research findings and infographics well.

On the other hand, stronger ties with academia and an influence on social/economic development could not be shown in the results, given that the OSL, as an entity, belongs to the university. The benefits of facilitating social and economic development may not be realized until the university shares the infographics with the public. Moreover, the nature of the research topic could not guarantee an immediate community impact.

The research students achieved various developmental outcomes. They acquired research skills, experience, and a professional perspective, apart from applying knowledge with a sense of achievement. They also connected course content with service and understood how teamwork and leadership theories are displayed in the workplace. The author argues that these benefits resulted from the instructor's conducive learning environment, the instructor, the community partner, and the OSL, under a well-structured research project with clear objectives, which responded to genuine community needs to create community impact and connect with course content. The research students thus gained a sense of autonomy and competence, which motivated them to learn. Furthermore, frequent interaction between the research students and the other stakeholders when reporting progress and discussing findings built strong relationship. It promoted relatedness, letting the research students feel the commitment of the instructor and the community partner and further motivating them to achieve more.

Although the research students did not develop a keen passion for research, they witnessed its power in action. Consequently, they maintained a positive view toward research, which could not have been achieved without intrinsic motivation and a genuine appreciation of research. Besides, the students did not mention much continual reflection as a learning outcome. This can be ascribed to being mainly engaged in data coding, analysis, and reporting. As the instructor had laid down the research framework, they were not expected to play roles in research design, which requires more critical thinking and reflection. In this light, a well-designed research project might confine students, causing a loss of autonomy and undermining their intrinsic motivation and reflection. Contrarily, giving too much freedom to inexperienced students would not achieve the intended learning outcomes. Therefore, a balance needs to be achieved.

Furthermore, the research students did not seem to show significant civic orientation enhancement and engagement with community knowledge for several possible reasons. First, the students might not easily connect the data coding and analysis task to the broader community. Second, the goal of investigating the WFH influence might not be highly associated with typical community scenarios, as in direct service in service-learning. Third, the online learning mode further increased psychological distance from the community. Previous research has highlighted that schools and the community context are essential in cultivating students' civic-mindedness (Revell, 2008), remarkably lacking in the online learning environment.

The small enhancement in civic orientation and engagement also echoed the OSL's concern over whether research-type service-learning could demonstrate community impact. The community impact generated by research-type service-learning is not easily demonstrated directly at the operational level. Take this project as an example: The community impact created by the infographics was indirect and will take time to emerge. The infographics will not be shared with the public until the university's next public activity or the next round of OSL internship recruitment.

In addition, the project's success proves the critical role of the community partner and institutional infrastructure in research-type service-learning, which is in alignment with the findings of previous studies (Marston & Nelson, 2014). The students could not have succeeded without the research team's dedication to supervision and training. Together with the

coordination supported by the OSL, they constituted a conducive learning environment to develop students' competence. The community partner's involvement in research design and active consultation with students ensured that the research project carried value and real community impacts.

To conclude, this evaluation has essentially confirmed the proposed model through empirical evidence. Figure 2 summarizes the findings and possible influencing factors.

Figure 2
The Outcomes Arising from the Research Projects and Possible Influencing Factors
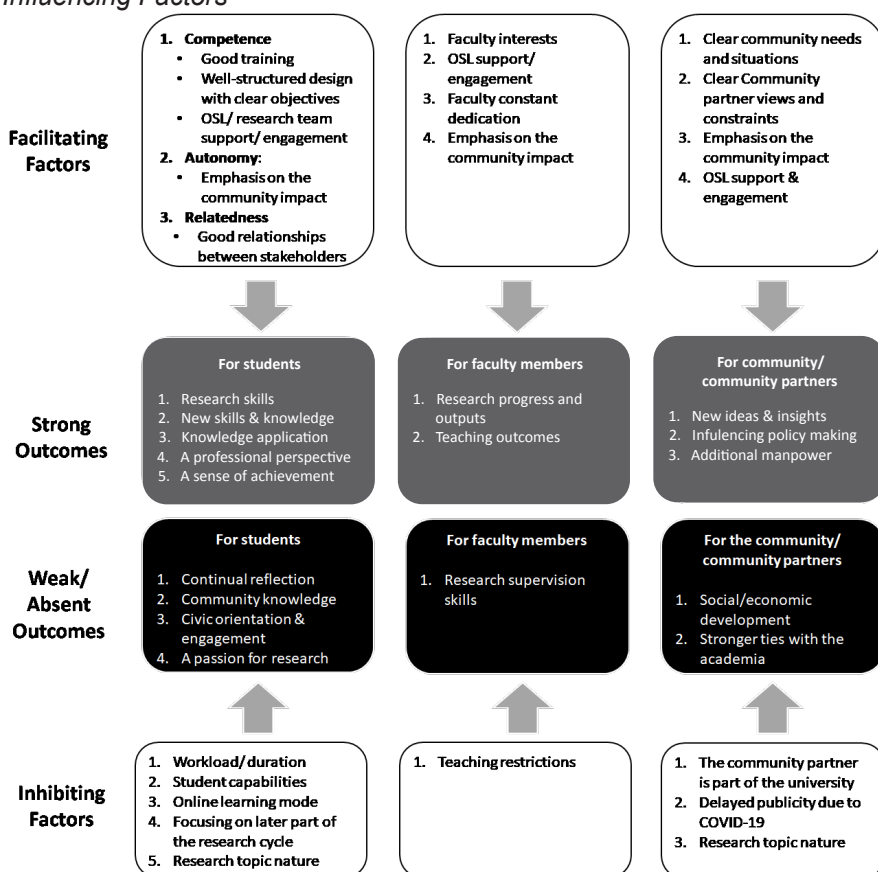
Implications, Limitations, and Further Research

This study draws several implications for the service-learning community. Theoretically, the model of research-type service-learning in this study supported SDT and demonstrated how it could satisfy the three basic psychological needs of intrinsic motivation to achieve teaching and learning benefits. Students' interest was increased by the value of impacting the community by applying their knowledge in real-life situations, which fulfills the need of autonomy. This finding is consistent with previous studies showing that meaningful and valuable service motivated students to be more committed with greater control over service and achieve the most significant learning outcomes. In contrast, meaningless service lowered their feelings of empowerment and undermined learning outcomes (Billig et al., 2005; Furco, 2002). A well-structured learning environment designed and supported by all stakeholders is conducive to developing students' sense of competence, as supported by past research findings (Law, 2012). Lastly, the reciprocal nature of service-learning between students, community partners, and instructors promotes relatedness. Reciprocity is advocated in service-learning such that all parties are both servers and served as regards teaching and learning, resulting in mutual benefits (Godfrey et al., 2005; Jacoby, 1996; Kendall, 1990). Past research has reported that genuine relationships fostered in service-learning between students and the community have helped students achieve various learning outcomes (Au Yeung et al., 2019; Khiatani & Liu, 2020; Lai, 2009). In this light, how the service-learning process and benefits can be theorized and affected by SDT can be further explored in future research.

The model and evaluation also offer several practical implications. First, by integrating faculty research and UG training in research skills, the evaluation illustrated that research-type service-learning created benefits for all stakeholders and was especially useful to engage faculty members by facilitating their research progress. Second, if research-type service-learning projects match course content, students can better apply their knowledge and strengthen developmental outcomes. Third, research-type service-learning has demonstrated its edge during the pandemic, as performing direct service becomes difficult. It may still be a good alternative in the post-COVID-19 era. Fourth, the evaluation reminded us of the importance of the community

in research-type service-learning; therefore, measuring community impact becomes critical. Fifth, given that service-learning is usually limited to a short duration (Tryon et al., 2008), such as one semester, it is recommended that stakeholders set out the research project goals within resources obtainable or consider a longer project period, as recommended by previous studies (Peterson & Schaffer, 1999; Reardon, 1994). Further research can explore how project duration affects the fulfillment of the psychological needs in SDT. For example, previous studies have indicated that students found it difficult to build good work relations within a short period (Lai Yeung, 2013).

Sixth, in a similar vein, the challenges mentioned by the stakeholders remind us of common obstacles in service-learning, including workload, workforce, and project difficulty level, consistent with past findings (e.g., Ma & Law, 2019; Lai Yeung, 2013). This challenge is particularly acute for students, as they must perform advanced research without a research background. As discussed, it is necessary to address and further explore how to achieve the right balance between workload, stakeholders' abilities and intended outcomes in designing service-learning.

This study has added value to the evidence-based service-learning practice and a new basis for faculty engagement. Several limitations should be noted. First, the model was evaluated on a single course with few participants, compromising its generalizability. Further research should test the model on larger and more heterogeneous samples, such as a diverse range of course subjects, research topics, student abilities, and types of community partners.

The second limitation lies in the type of community partner. As the OSL professionally supports service-learning, unknown benefits and challenges may emerge when research-type service-learning is extended to other community partners. Further studies should address this with community partners outside the university.

The third limitation arises because research projects are usually longer than regular service-learning courses. This leaves room for an investigation into how research projects benefit from more extended service-learning programs, such as a year or more.

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