10th International Conference on Higher Education Advances (HEAd'24)
Universitat Politècnica de València, València, 2024
DOI: https://doi.org/10.4995/HEAd24.2024.17341

Effect of an authentic design thinking learning experience on collaboration, social problem-solving and satisfaction in physiotherapy and dietetics students

Nicola Dervan[1,2], Clare Corish[1,2], Celine Murrin[1,3], Annelie Shaw[1,2], Caoimhe, Kenny[1], Mags Carey[3], Ruth, Charles[1,2], Grainne O'Donoghue[1]

[1]School of Public Health, Physiotherapy and Sports Science, University College Dublin, Ireland, [2]Institute of Food and Health, School of Agriculture and Food Science, University College Dublin, Ireland, [3]Healthy UCD, University College Dublin, Ireland.

How to cite: Dervan, N.; Corish, C.; Murrin, C.; Shaw, A.; Kenny, C.; Carey, M.; Charles, R.; O'Donoghue, G. Effect of an authentic design thinking learning experience on collaboration, social problem-solving and satisfaction in physiotherapy and dietetics students. In: 10th International Conference on Higher Education Advances (HEAd'24). Valencia, 18-21 June 2024. https://doi.org/10.4995/HEAd24.2024.17341

Abstract

Aims: This study aimed to assess i) the effect of a design thinking learning experience in an authentic 'real world' environment on physiotherapy and dietetics students' skills in collaboration and social problem-solving and ii) their satisfaction with the learning experience.

Methods: A single group, quasi-experimental study with a pre- and post-test design involving 46 physiotherapy and dietetics students. Data were collected using self-administered anonymous questionnaires: the Interprofessional Collaborative Competency Attainment Scale-Revised, the Social Problem-Solving Inventory-Revised Short Form and a bespoke questionnaire exploring student satisfaction with the experience.

Results: Mean scores for collaboration were significantly higher following the learning experience. Social problem-solving skills did not change. Students reported satisfaction with engagement, support, and structure of the learning experience.

Conclusions: A design thinking approach can improve skills in interprofessional collaboration. Students reported satisfaction with the learning experience. The development and assessment of social problem-solving skills using a design thinking approach requires further research before definitive conclusions can be drawn on this topic.

Keywords: *Design thinking; interprofessional education; problem solving; dietetics; physiotherapy.*

This work is licensed under a Creative Commons License CC BY-NC-SA 4.0
Editorial Universitat Politècnica de València

1. Introduction/Background

Healthcare professional (HCP) students need to acquire not only knowledge and skills in the basic and clinical sciences but, importantly, must simultaneously demonstrate the thinking processes required to resolve complex patient problems and navigate rapidly evolving environments (Baruch, 2017; McLaughlin et al, 2019). Learning to develop critical thinking, problem-solving, effective communication and collaborative practice skills are core to contemporary HCP curricula (Van de Grift & Kroeze, 2016: Cengiz et al, 2023) to enable the next generation of HCPs to deliver evidence-based, person-centred care.

There is a growing body of evidence that interprofessional collaboration (IPC) can enhance responsiveness to the needs of the service user to meet common interdisciplinary team goals and improve service user and healthcare systems outcomes (McLaney et al, 2022). The World Health Organisation (WHO) Framework for Action on Interprofessional Education and Collaborative Practice (2010), defines interprofessional education (IPE) as a strategic approach when "two or more professionals learn about, from and with each other during their education in the development of effective collaboration for future practice" (Gilbert et al, 2010. To date, achieving effective integration in HCP pre-registration programmes has been challenging, predominantly due to structural, curricular, financial, cultural, and organisational issues (Samarasekera et al, 2022; Frenk, 2022 et al).

Design Thinking (DT) provides an innovative approach to collaborative problem-solving that utilizes a user-driven process to design and deliver an impactful solution that meets the needs of the user (Ingram et al, 2022). The process supports the development of skills in critical thinking, problem-solving, collaboration and communication (Van de Grift et al, 2016) and is consistent with patient-centred care (Huang et al, 2021). Design thinking generally includes five steps, namely, "empathy", "define", "ideate", "prototype" and "test" and although described as a linear process, it is iterative when applied. The process requires team members to practice and communicate divergent and convergent thinking processes to collaboratively create and test the best fit solution to user problems (Beard et al, 2018). Most studies examining the implementation of DT methodology and processes in HCP curricula to date have been conducted in medical students' education and are limited (Van de Grift et al, 2016, Huang et al, 2021). To the best of our knowledge, the DT approach is yet to be applied in the education experience and curricula of physiotherapists and dietitians.

Healthy UCD is a health promotion initiative in University College Dublin (UCD) which endeavours to create a culture supportive of healthy lifestyle choices for the university community and raises awareness of individuals staff and student capacity to improve their own health status. It is aligned with national government strategy in Ireland and to the Irish Health Services (HSE) efforts to promote the WHO 'healthy campus' concept (HSE, 2023).

By engaging with, and in partnership with Healthy UCD, we created an authentic 'real world' experiential learning opportunity for physiotherapy and dietetics students, to create a health promotion campaign underpinned by a DT approach. This paper provides an overview of the process, presents our findings in relation to the effects of the learning experience on the students' perceived IPC and problem-solving skills, and explores their satisfaction with the learning experience.

2. Methodology

2.1 Study design, setting and participants

A quasi-experimental study with a pre-test: post-test design was conducted in UCD, Ireland from September to November 2023. All students involved in the development of a university-wide healthy eating active living campaign (23 MSc in Clinical Nutrition & Dietetics, 23 Professional MSc in Physiotherapy) were invited to participate. Both student groups had experience in interdisciplinary problem-based learning from previously taught modules; however, neither group had previous exposure to DT.

2.2 Procedure prior to intervention

Students' participation was voluntary. An information pack outlining the study purpose, aims, rationale, participation process and study data management was provided to each student via the university's virtual learning platform to enable informed decision-making for study participation. Students were provided with access to study questionnaires also via the virtual learning platform and consent was obtained prior to completion. All information collected was anonymous. Authors obtained permission to use study questionnaires. The study was approved by the Human Research Ethics Committee-Sciences in UCD (LS-C-23-162-Dervan Low Risk).

2.3 Measures

Data were collected using self-administered questionnaires.

2.3.1 Interprofessional collaboration assessment

The Interprofessional Collaborative Competency Attainment Scale-Revised (ICCAS-R) is a self-validated administered 21-item questionnaire; 20 questions measure six interprofessional skill dimensions namely communication, collaboration, roles and responsibilities, collaborative patient-family-centred care, conflict management/resolution and team functioning using a 5-point Likert scale (1 = poor to 5 = Excellent) (Archibald et al., 2014; Schmitz et al., 2017). Higher total scores represent higher IPC competency. An additional question asks students to compare their ability in IPC after the learning activities using a 5-point qualitative scale ranging

from much worse now to much better now. The tool was developed as a retrospectively administered pre-test: post-test tool in healthcare students and practicing clinicians to self-assess IPC competencies (Archibald, 2014).

2.3.2 Problem-Solving assessment

The Social Problem-Solving Inventory-Revised-Short Form (SPSI-R:SF) is a validated 25-item self-report questionnaire that assesses functional and dysfunctional characteristics to solving life problems D'Zurilla et al, 2002, Hawkins et al, 2009). It consists of five different scales which measure the five-dimension social problem-solving model (positive problem orientation (PPO; 5 items), negative problem orientation (NPO; 5 items), rational problem-solving (RPS; 5 items), impulsivity carelessness style (ICS: 5 items) and avoidant style (AS; 5 items) (D'Zurilla, 2002)). Each item is rated on a 5-point Likert scale ranging from 0 which represents "not at all true to me" to 4 which represents "extremely true of me". Totals are calculated for each subscale as well as for a cumulative score. Higher total scores are indicative of a higher level of social problem-solving skills. Higher scores on the PPO and RPS represent more adaptive problem-solving whereas higher scores on the NPO, ICS and AS are reflective of a more maladaptive approach to problem-solving.

2.3.3 Student satisfaction

Student satisfaction was assessed using a bespoke questionnaire rated on a 3-point Likert scale (agree, disagree, agree nor disagree). The students were asked whether they perceived changes in their skills in communication, collaboration, problem-solving and health promotion, and if the experience was engaging, offered sufficient support and had a good structure.

2.2 Intervention

Design thinking methodology and processes underpinned the learning experience, which required students to collaboratively create a user-centred health promoting campaign for the university community. The learning experience was completed over nine weeks and, from the outset, students worked in mixed discipline groups of four or five. Table 1 outlines the experience. The process was supported by educators with previous experience in DT. Students worked with key stakeholders within and outside the university to enable implementation of their initiatives (prototypes). The ICCAS-R and SPSI-R:SF were administered pre- and post-the learning experience, while the satisfaction questionnaire was administered following the learning experience.

Table 1. Outline of the 9-week DT learning experience

Week	Components
1: Plan	Day 1: Introduction, team building activities, health promotion and project management lecture facilitated by educators with DT and health promotion expertise. Day 2: Creativity workshop, DT empathy phase completed (students observed, conducted in-person/online interviews and surveys, reviewed available literature and reports). Day 3: Define phase (students identified a user-centred problem statement using mixed methods including system mapping, student/staff journey mapping, thematic analysis); ideate phase (students utilised ideation methods such as brainstorming/writing, De Bono's hats, nominal voting to create a problem statement solution). Day 4: Ideate phase completion (as above); prototype (initiative) phase (students presented their problem statement solutions to the physiotherapy and dietetic programme teams, and Healthy UCD health promotion officer). Day 5: Ideate and Prototype (initiative) phase (students developed their prototype based on learnings/insights from day 4); student project management team established.
2-7	6-hour group work developing prototypes (initiatives) and campaign. Students worked in their mixed discipline groups and with the project management team. Support was available from the UCD health promotion officer each week for 1-2 hours at the beginning of the day.
8: Test	Students implemented a 1-week health promotion campaign in collaboration with Healthy UCD and relevant stakeholders. Prototypes (initiatives) included signposting in student union shops on healthy food choices, easy to follow instructional videos available via QR codes for gym equipment in the student gyms, incorporation of vending machines with reasonably priced healthy pre-packaged meals, creation of a walking community and resources on walking trails, an online healthy living campus map and wellness workshops with exercise classes and healthy recipes demonstrations.
9: Evaluate	Students completed one evaluation report per group on their DT process, prototypes, and evaluation from testing of prototypes (surveys, questionnaires, social media analytics, user feedback) for feedback to Healthy UCD.

2.3 Data analysis

The data were analysed using SPSS Version 29. Descriptive statistics are provided. As data was normally distributed, paired *t*-tests were used to compare the pre-post mean and standard deviations for the ICCAS-R and the SPSI-R: SF. The significance level was set at $P<0.05$.

3. Results and Discussion

Ninety one percent (42/46) of students completed the ICCAS-R and SPSI-R:SF while 87% (40/46) completed the satisfaction questionnaire.

3.1 Effect on students' IPC competency

Students' perceived IPC competency increased significantly from 63.8 (SD 8.6) to 79.9 (SD 8.5) post intervention (P<0.001). Significant increases (p<0.001) also occurred across all skill dimensions. Total scores, subscale skill dimension scores and analyses are summarised in Table 2. Thirteen students completed the question rating their ability to collaborate interprofessionally after the learning activities, with all but one (12/13) reporting their ability to be somewhat better or much better following the learning experience.

Table 2. Effect of the learning experience on interprofessional competency

Skill dimensions	Pre mean (SD)	Post mean (SD)	Mean difference (SD)	t-test	p*
Communication	15.7 (2.2)	19.6 (2.2)	3.9 (3.5)	7.1	<0.001
Collaboration	9.6 (1.7)	12.2 (1.6)	2.6 (2.2)	7.7	<0.001
Roles & Responsibilities	13.5 (2.1)	16.4 (1.8)	2.9 (2.2)	5.8	<0.001
Collaborative patient-centred approach	9.0 (2.1)	11.3 (1.9)	2.3 (2.5)	5.8	<0.001
Conflict management/resolution	10.1 (2.1)	12.5 (1.6)	2.4 (2.9)	5.3	<0.001
Team functioning	5.9 (1.3)	8.1 (1.4)	2.1 (1.9)	6.9	<0.001
ICCAS-R total	63.8 (8.6)	79.9 (8.5)	16.07 (12.8)	8	<0.001

SD=Standard deviation; ICCAS=Interprofessional Collaborative Competency Attainment Scale-Revised. *p=significant difference between the groups (p<0.05).

3.2 Effect on students' social problem solving.

Table 3 provides an overview of the mean total scores in social problem-solving and the subscale skill dimensions. Social problem-solving scores remained similar pre-post intervention.

3.3 Student satisfaction and feedback

Most students (87.5%; 35/40) reported the learning experience as engaging, 90% (36/40) reported that they had sufficient support and 82.5% (33/40) were satisfied with its structure. In relation to clinical skills, 95% (38/40) reported improvement in health promotion ability, 75% (30/40) in communication, 90% (36/40) in IPC and 70% (28/40) in problem-solving.

Table 3. Effect of the learning experience on social problem-solving

Functioning	Skill dimensions	Pre mean (SD)	Post mean (SD)	Mean difference (SD)	t-test	P*
Adaptive problem-solving	Positive problem orientation	100.6 (10.44)	103.1 (12.64)	2.5 (15.93)	1.01	0.315
	Rational problem solving	95.33 (12.99)	100.12 (12.62)	4.76 (17.69)	2.5	0.89
Maladaptive problem-solving	Negative problem orientation	97.96 (11.71)	92.89 (9.18)	5.04 (13.01)	-1.74	0.18
	Impulsivity-carelessness style	93.71 (12.53)	94.71 (14.29	1 (20.89)	-0.31	0.758
	Avoidance style	96.42 (10.63)	95.5 (12.05)	0.83 (17.34)	0.378	0.757
	SPSI-R:SF total	102.21 (10.71)	105.64 (10.53)	3.49 (14.07)	1.58	0.122

SD=Standard deviation; SPSI-R:SF=Social Problem-Solving Inventory-Revised-Short Form. *p=significant difference between the groups ($p<0.05$).

3.4 Discussion

The purpose of this study was to examine the changes in physiotherapy and dietetics students' self-reported skills in IPC and social problem-solving before and after a health promotion learning experience underpinned by DT methodology and processes. Overall, significant improvements were observed in students' self-reported skills in IPC across all skill dimensions. In addition, students reported high levels of satisfaction and an improvement in clinical skills in health promotion, communication, IPC and social problem-solving after the learning experience. These results are consistent with previous results that demonstrate improvements in self-efficacy skills in IPC and high levels of satisfaction with DT learning experiences in HCP education (Wang et al,2018; Van de Grift 2016).

In terms of problem-solving skills, no significant changes were noted. Previous data on the effectiveness of DT in developing problem-solving skills in HCP education is lacking (McLaughlin et al, 2019) making it difficult to compare our findings. However, it is worth considering that our students' mean total scores were within the normal range for social problem-solving at baseline, which may have caused a ceiling effect. Further research is needed before definitive conclusions can be drawn on this topic.

The results of this study should be interpreted in the context of its limitations. Firstly, changes to IPC and social problem-solving were self-reported with no objective assessment of competency. Secondly, post test results could have been influenced by social desirability; students may have inflated their responses to demonstrate improvement from the learning experience. In addition, while the SPSI-R:SF is a validated tool for measuring self-reported

changes in social problem-solving ability, it has not been frequently applied in a third level student population. Hence, its ability to show variation in this context may need further exploration. Finally, and important to note, all students had prior experience with interprofessional problem-based learning activities. This previous exposure to theory and practice in IPC and problem-solving may have impacted on how they perceived their abilities in social problem-solving and collaboration.

In conclusion, our findings provide preliminary data that show using a DT approach in an authentic 'real world' learning environment can improve skills in IPC and facilitate an engaging learning experience for dietetics and physiotherapy students. Further research is required to develop and assess the impact of DT on social problem-solving skills in healthcare professional students.

References

Archibald, D., Trumpower, D., MacDonald, C.J. (2014) Validation of the interprofessional collaborative competency attainment survey (ICCAS). J Interprof Care, 28(6):553–558.

Baruch, J. M. (2017). Doctors as Makers. *Acad Med*, 92(1), 40-44.

Beaird, G., Geist, M., Lewis, E.J. (20018) Design thinking: Opportunities for application in nursing education, *Nurse Education Today*, 64;115-118.

Cengiz, Z., Gürdap, Z., Oltuluoğlu, H., Aslan, H., Çevik Aktura, S. (2023) Developing nursing students' self-efficacy and problem-solving skills via high-fidelity simulation. *Teaching and Learning in Nursing*, 18(4), 167-173.

D'Zurilla, T. J., Nezu, A. M., Maydeu-Olivares, T. (2002) Social Problem-Solving Inventory Revised (SPSI-R): Manual. North Tonawanda, NY: Multi-Health Systems.

Frenk, J., Chen, L.C., Chandran, L., Groff, E.O.H., King, R., Meleis, A. (2022) Fineberg HV. Challenges and opportunities for educating health professionals after the COVID-19 pandemic. *Lancet*, 29;400(10362):1539-1556.

Gilbert, J.H., Yan, J., Hoffman, S.J. (2010) A WHO report: framework for action on interprofessional education and collaborative practice. *J Allied Health,* 39(Suppl 1):196-7.

HSE Health Services Healthy Ireland plan 2023-2027.

Huang, C.Y., Tsai, L.Y., Chung, C.H., Shih, F.F., Wang, Y.M. (2023) The effect of design thinking approach in interprofessional education programme of human sexuality course: A quasi-experimental design. *Nurs Open*, 10(2):967-976.

Ingram, C., Langhans, T., Perrotta, C. (2022) Teaching design thinking as a tool to address complex public health challenges in public health students: a case study. *BMC Med Educ,* 22;270.

Kruger, J. S., Tona, J., Kruger, D. J., Jackson, J. B., Ohtake, P. J. (2023). Validation of the Interprofessional Collaborative Competency Attainment Survey (ICCAS) retrospective pre-test measures. *Journal of Interprofessional Care*, 1–6.

McLaney, E., Morassaei, S., Hughes, L., Davies, R., Campbell, M., Di Prospero, L. (2022) A framework for interprofessional team collaboration in a hospital setting: Advancing team competencies and behaviours. *Healthc Manage Forum*, 35(2):112-117.

McLaughlin, J.E., Wolcott, M., Hubbard, D., Umstead K., Rider, T.R. (2019) A qualitative review of the design thinking framework in health professions education. *BMC Med Educ* 19, 98.

Samarasekera, D.D., Nyoni, C.N., Amaral, E., Grant, J. (2022) Challenges and opportunities in interprofessional education and practice. *Lancet*, 29;400(10362):1495-1497.

Schmitz, C.C., Radosevich, D.M., Jardine, P., MacDonald, C.J., Trumpower, D., Archibald, D. (2017) The interprofessional collaborative competency attainment survey (ICCAS): a replication validation study. *J Interprof Care*,31(1):28–34.

Van de Grift, T.C., Kroeze, R. (2016) Design Thinking as a Tool for Interdisciplinary Education in Health Care. *Acad Med*, 91(9), 1234-8.