Journal of Rehabilitation Practices and Research

Integrating Assignments into Occupational Therapy Education: Linking Experiential Learning and Technology Application

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Article Details

Article Type: Research Article

Received date: 03rd December, 2025

Accepted date: 15th January, 2026

Published date: 19th January, 2026

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Citation: Corro, N., (2026). Integrating Assignments into Occupational Therapy Education: Linking Experiential Learning and Technology Application. *J Rehab Pract Res, 7*(1):195. https://doi.org/10.33790/jrpr1100195

Abstract

This study examined the impact of integrating 3D printing assignments into an occupational therapy (OT) curriculum based on students' experiential learning, knowledge, and perceptions of relevance to practice. With growing interest in maker technologies and assistive device design, 3D printing offers a meaningful avenue for hands-on, creative learning. An exploratory one-group, pretest–posttest, repeated-measures design was conducted over six weeks with second-year entry-level OT students (N = 26) at a single academic institution. A survey questionnaire, developed by aligning Kolb's Experiential Learning Cycle (ELC) with the Technology Acceptance Model (TAM), measured changes in perceived relevance to OT practice, knowledge of 3D printing, and perceptions of curricular integration. Results from one-sample z tests showed statistically significant increases in perceived relevance ($p = .03$), knowledge ($p < .001$), and curricular integration ($p = .016$) following the assignment. These findings support the integration of 3D printing as an experiential learning strategy to strengthen OT students' understanding of assistive technology and its application in practice. Implications for OT education highlight the value of curriculum design approaches that foster innovation, problem-solving, and client-centered thinking through the adoption of emerging technologies.

Keywords: Assistive Technology, OT Education, Experiential Learning, Curriculum Development, Instructional Strategies, 3D Printing

Introduction

In recent years, assistive technology has attracted more attention in the healthcare field. Designing and creating customized assistive device solutions without relying on costly commercialized tools in the market allows for an affordable intervention within the context of many environments [1]. 3D printing is one of several methods used to create personalized devices that support client engagement and participation in activities of daily living [2, 3], and it may provide more affordable and longer-lasting options compared to other approaches [4]. These devices may include a range of tools designed to assist with task completion, such as grips for writing utensils and adaptive holder for feeding, key holders, can openers, as well as adapted video game controllers. The concept of 3D printing has been expanded to broader medical applications, including tissue and organ fabrication, implants and prosthetics, and pharmaceutics [5]. Within the field of OT, the integration of 3D printing is gaining practical application for client use such as the use of adaptive devices in community and school systems [6]. "Emerging research supports 3D printing can provide customizable, low-cost, and replicable items for application in occupational therapy, but more research is necessary to inform occupational therapists on why and how 3D printing would be applicable and feasible in practice" [7].

Review of Literature

Entry-level OT education emphasizes andragogical principles that actively engage students in applying knowledge to practice, with specific attention to preparing them to evaluate and implement technologies that enhance client engagement and quality of life [8, 9]. Thus, OT Programs must provide hands-on and experiential learning opportunities that integrate technology and environmental adaptation (e.g. [ACOTE®] 2023 standards A.4.1, B.4.1, D.2.3). These standards highlight the need for students to demonstrate evidence-based reasoning in selecting and adapting assistive technologies, including the ability to justify how modifications enhance occupational performance, support meaningful participation, and improve well-being. Contemporary learners (often described as "digital natives") also expect interactive and technology-integrated instruction [10]. Studies confirm OT students' preference for experiential and multimodal teaching approaches [11], and early investigations suggest that incorporating 3D printing into coursework enhances students' acceptance of the technology [12].

Experiential learning is a key component in OT education, supporting the development of clinical reasoning by integrating theoretical knowledge with practical application through active participation and reflection [13, 14]. According to Sewchuk [15], experiential learning provides a "*theoretical framework for bridging the gap between theory and practice*" (p. 1311), underscoring the importance of applying hands-on strategies in professional curricula. Kolb's Experiential Learning Theory (1984) frames this process as a cycle of *concrete experience, reflective observation, abstract conceptualization, and active experimentation* [14]. A well-designed 3D printing assignment provides a unique opportunity to engage OT students across this cycle: fabricating adaptive tools for ADLs and IADLs (*concrete experience*), reflecting on their usability (*reflective observation*), applying theoretical frameworks to design choices (*abstract conceptualization*), and refining tools through iterative testing (*active experimentation*). The integration of emerging technologies into OT education is further informed by the Technology Acceptance Model (TAM), which highlights the importance of *perceived usefulness* and *ease of use* in shaping adoption [16]. Engagement with 3D printing, therefore, depends not only on students' learning experiences but also on their confidence and recognition of its potential to enhance client-centered care and innovation.

In response to recent calls in the literature to evaluate the integration of technology in OT curricula [7, 13, 17] faculty at Missouri State University implemented a survey to OT students to examine the impact of a 3D printing course assignment. The survey targeted three key variables: (1) the relevance of 3D printing to clinical fieldwork and professional practice, (2) students' knowledge and confidence in using 3D printing technology, and (3) the perceived value of incorporating 3D printing into the OT curriculum. These variables were deliberately aligned with Kolb's ELC and the TAM, creating a comprehensive framework for evaluating both learning outcomes and technology adoption. Guided by this framework, the study tested the overarching hypothesis that integrating a 3D printing assignment into OT education would significantly enhance students' experiential learning and technology acceptance, as evidenced by increased perceptions of relevance, knowledge, and curricular value.

Methods

Research Design

The study comprised of repeated measures pre- and post- survey questionnaire on Qualtrics with anonymized data collection. The questionnaire was distributed online between September and December 2024.

Participants

Participants (n = 26) were OT students recruited from the Fall Semester 2024 Assistive Technology course in Missouri State University OT Program. This reflects the total number of OT students enrolled in one cohort of entry-level Master's degree. Students were currently in their second year of the OT Program for the duration of the study.

Ethical Considerations

Approval was obtained from the ethical review committee of Missouri State University's Office of Research Administration (IRB-FY2025-65) prior to conducting the study. Written informed consent was obtained from each participant for their voluntary participation and that non-participation or withdrawing at any time would not result in academic or personal disadvantage. All data were anonymized and stored securely in compliance with institutional policies and ethical research standards.

Procedure

To eliminate potential bias, OT faculty announced the opportunity to participate in an online study two weeks prior to the scheduled lecture content on 3D printing. After signing an electronic informed consent, the students proceeded in completing the pre-test survey questionnaire before the day of the scheduled lecture content in class. The 3D printing lecture content created by OT faculty was 165 minutes in duration and was implemented in class after the student sample (N=26) completed the pretest. Within that lecture time duration, students were provided with introduction to 3D printing, and the value of 3D-printed adaptive devices and steps involved in creating them were explained. Students were also provided practical examples in designing and exploring potential clinical applications and troubleshooting devices as need arises. Students were then placed into smaller groups of four (except for 2 groups of five members) as they received guidance on how to operate the 3D printers. One 3D printer was available for use and was strategically placed in a separate research room to ensure safety with adequate ventilation as needed, away from student classrooms and faculty offices [18]. Following group work and device fabrication, students completed reflection papers and delivered peer presentations to share their projects and experiences. The posttest survey was administered after students had completed the 3D printing assignment.

Lesson Plan

The lecture and assignment were designed with the following learning objectives:

1. Apply 3D printing technology in OT by selecting, modifying, and printing an adaptive device for various areas of occupation based on the *Occupational Therapy Practice Framework–4th edition* [19].
2. Explain the kinesiology, biomechanics, and physics principles underlying the device's design and function.
3. Justify the device's use by explaining how it enhances quality of life, occupational performance, and overall participation.

Each student group selected a unique 3D project for printing, with faculty approval required to prevent duplication. Groups considered project complexity to ensure print time did not exceed five hours. Because only one printer was available, students collaborated across groups to coordinate scheduling and timely project completion. The 3D printing assignment was completed over six weeks during the Fall 2024 semester and involved the following steps:

1. Researching and Selecting a 3D Model:'
   - *Locate an appropriate adaptive tool addressing a specific client need in ADLs or IADLs (e.g., modified utensils, key turners, jar openers, pill containers) [19].*
   - *Use open-source databases such as Thingiverse or GrabCAD to identify designs [20].*
   - *Provide a rationale for the project and identify a target population (e.g., individuals with arthritis, stroke survivors) [21].*
2. 3D Model Preparation:
   - *Download the model file (preferably in. STL format) [22].*
   - *Prepare the model in slicer software, adjust as needed for therapeutic usability, and save in G-code format [23].*
   - *Document the preparation process, such as capturing evidence (e.g., a screenshot of the model ready for printing) [24].*
3. 3D Printing Process:
   - *Schedule a printing session and print the adaptive tool.*
   - *Document the process with photos or videos, noting challenges and solutions.*
   - *Maintain a log of total print time and encountered difficulties.*
4. Reflection and Application:
   - *Write a 300–400 word reflection discussing the experience of using 3D printing in OT.*
   - *Address potential clinical applications, benefits, and challenges of integrating 3D printing into practice.*

Materials and Measurements

To evaluate the effectiveness of the lesson plan for 3D printing lecture and course assignment, we developed a 19-item questionnaire aligned based on Kolb's ELC and TAM framework. Items emphasized perceived usefulness (PU) and perceived ease of use (PEOU)-core constructs of the TAM- in order to reflect their influence on user acceptance and behavioral intention [16, 25]. To strengthen applicability to OT education, items were also conceptually aligned with Kolb's ELC, which frames learning as a cycle of *concrete experience, reflective observation, abstract conceptualization, and active experimentation* [14]. This dual alignment allowed the instrument to capture both students' learning processes and their acceptance of emerging technology. Kolb's theory captures the learning process by describing how students' progress through stages of exposure, reflection, conceptualization, and application. In contrast, the TAM model explains the process of technology adoption by emphasizing perceptions of usefulness, ease of use, and the intention to apply technology in practice. Together, these frameworks provide complementary perspectives: Kolb's ELC highlights how students acquire and apply knowledge, while TAM addresses the factors that influence whether students will embrace and integrate new technologies, such as 3D printing, into OT practice. Each item created on the questionnaire domains were mapped into both constructs as detailed in Table 1. The questionnaire was administered in pre- and post- intervention via Qualtrics, with all responses anonymized. The questionnaire was organized into three variables:

1. Relevance of 3D Printing to OT Practice – Items from this variable reflect perceptions of professional significance and applicability to clinical fieldwork and future practice, aligning with Kolb's *reflective observation* and *active experimentation*, and TAM's PU and behavioral intention.
2. Knowledge in 3D Printing – Items from this variable reflect familiarity, confidence, and competence in using 3D printing technology, corresponding to Kolb's *concrete experience* and *abstract conceptualization,* and TAM's PEOU.
3. Integration of 3D Printing into the OT Curriculum – Items from this variable reflect perceptions of the educational value of embedding 3D printing in coursework, reflecting all four Kolb stages as well as TAM's PU, PEOU, and behavioral intention.

Variable	Item	Kolb's ELC Stage	TAM Construct
Relevance to OT Practice	Q2. Have you ever used a 3D printer before?	CE	—
Relevance to OT Practice	Q3. Have you ever used a slicer software for 3D printing?	CE	—
Relevance to OT Practice	Q4. Importance of 3D printing in OT	RO	PU
Relevance to OT Practice	Q16. Integration enhances OT understanding	RO	PU
Relevance to OT Practice	Q17. Benefits in OT practice areas	AC	PU
Relevance to OT Practice	Q18. Likelihood of using knowledge in practice	AE	BI
Relevance to OT Practice	Q19. Anticipated challenges in integration	AE	PEOU
Knowledge in 3D Printing	Q1. Familiarity with 3D printing	CE	PEOU
Knowledge in 3D Printing	Q7. Expectations for learning aspects	CE/AC	PU
Knowledge in 3D Printing	Q8. Concerns about barriers	RO	PEOU
Knowledge in 3D Printing	Q10. Confidence in ability to use	AE	PEOU
Knowledge in 3D Printing	Q11. Preferred learning styles	AC	PEOU
Knowledge in 3D Printing	Q12. Current understanding of 3D printing	AC	PU
Knowledge in 3D Printing	Q13. Competence in applying clinically	AE	BI
Integration into Curriculum	Q5. 3D printing enhances OT interventions	CE	PU
Integration into Curriculum	Q6. Usefulness in OT areas	CE/AC	PU
Integration into Curriculum	Q9. Confidence in ability to learn	AE	PEOU
Integration into Curriculum	Q14. Inclusion enhances experiential learning	RO	BI
Integration into Curriculum	Q15. Curriculum enhances creativity/ problem-solving/application	AC/AE	BI

Table 1. Mapping of Questionnaire Items to Kolb's ELC and TAM Constructs

Note. **CE** = Concrete Experience; **RO** = Reflective Observation; **AC** = Abstract Conceptualization; **AE** = Active Experimentation; **PU** = Perceived Usefulness; **PEOU** = Perceived Ease of Use; **BI** = Behavioral Intention. *Dashes (—) indicate items not explicitly mapped to TAM constructs.*

The survey questionnaire instrument was reviewed by an OT faculty member with expertise in assistive technology and a staff from Research, Statistical Training, and Technical Support Institute (RSTATs) of Missouri State University to ensure clarity, relevance, and appropriateness for the student population. Reliability analysis yielded acceptable internal consistency, with Cronbach's alpha values of .82 (knowledge), .85 (relevance), and .88 (integration), indicating strong reliability across domains. A detailed outline of the pre- and post-survey questions is provided in Table 2.

Variable	Items
Relevance to OT clinical fieldwork/ practice	Q2. Have you ever used a 3D printer before?
	Q3. Have you ever used a slicer software for 3D printing?
	Q4. How important do you think 3D printing is for the future of occupational therapy?
	Q16. To what extent do you agree with the following statement: "The integration of 3D printing would positively impact my understanding of occupational therapy concepts in assistive
	technology."
	Q17. How beneficial would using 3D printing technology be in the following areas of OT practice?
	Q18. How likely would you be to use your knowledge gained in 3D printing technology from this course in your future OT clinical fieldwork or clinical practice?
	Q19. How challenging do you anticipate the following areas to be in integrating 3D printing into OT practice?
Knowledge in 3D printing	Q1. How familiar are you with 3D printing technology?
	Q7. Rate the following curricular aspects based on your expectations from a course on 3D printing in OT: Learning to design 3D models Understanding the practical applications of 3D printing in OT Hands-on experience with 3D printers Case studies and real-world applications Collaboration on projects involving 3D Printing
	Q8. Rate the following aspects of considerations based on your concern for integrating 3D printing into the OT curriculum. Cost of equipment and materials Steep learning curve Limited access to 3D printers Time required to learn and apply the technology
	Q10. How confident are you in your ability to USE 3D printing technology in your OT practice?
	Q11. How do you prefer to learn new skills and concepts in use of 3D printing in OT? Lectures Hands-on practice on clinical applications Group projects Online tutorials Reading materials
	Q12. How would you rate your current understanding of 3D printing technology?
	Q13 How competent do you currently feel in applying 3D printing technology in OT clinical fieldwork or clinical entry-level practice?
Integration of 3D printing into OT curriculum	Q5. Do you agree that 3D printing can enhance the effectiveness of occupational therapy interventions?
	Q6 How useful do you think 3D printing can be in the following areas of OT? Assistive Devices Orthotics and Prosthetics Adaptive Equipment Pediatric Interventions Adult and Geriatric Interventions
	Q9 How confident are you in your ability to LEARN 3D printing technology in your OT practice?
	Q14 To what extent do you agree with the following statement: "The inclusion of 3D printing in the OT curriculum would enhance my overall experiential learning experience."
	Q15 How would the inclusion of 3D printing enhance the following aspects of your learning? Problem-solving skills in adapting devices for clients Creativity in adapting devices for clients Clinical applications of ADL/ IADL adaptive devices for clients

Table 2. Pretest and Posttest Questionnaire

JRPR, an open access journal
ISSN 2581-3846

Results

OT students (*n* = 26) were surveyed prior to and after the implementation of a 3D printing course assignment as to its relevance, knowledge, and integration. Before implementation, only three of the students indicated that they had used a 3D printer (11.54%). Further, only one indicated that they used slicer software for 3D printing (3.85%). All subscale items were rated on a scale from 1 to 10, with the ranges of possible summary scores as follows: relevance (16-160), knowledge (6-60), and integration (18-180). See Figure 1 for a visual depiction of the results.

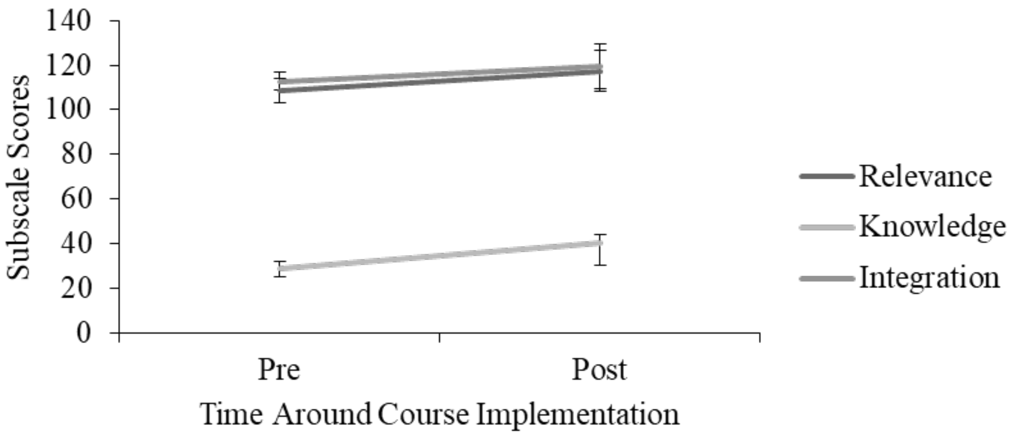

Figure 1: Subscale Ratings from Pre- to Post-Implementation

Note. Possible subscale summary score ranges: relevance (16-160), knowledge (6-60), and integration (18-180).

Prior to running the analyses, the data was screened for accuracy, missing values, outliers, and the assumption of normality. Of the 26 students that responded to the pre survey, 15 were retained on the post survey. On the post survey, two participants were missing > 5% of their data and were excluded pairwise from the analyses. No significant outliers were found, as indicated by z scores < |+ 3|. The assumption of normality was met, as indicated by Shapiro-Wilk test *ps* > .001 [26].

Reliability and Item Analyses

Three reliability and item analyses were performed on pretest data to assess the psychometric properties of the instrument for the three variable subscales, namely perception of 3D printing in OT relevance, knowledge, and integration subscales, with IBM SPSS Statistics software (Version 25.0; IBM Corp., Armonk, NY). The Cronbach's alpha was used to calculate the 3 variables: for the relevance subscale was α = 0.83 with good internal consistency; knowledge subscale was α = 0.76 with acceptable internal consistency and individual subscale item yielded positive correlation coefficients of above 0.30; integration subscale was α = 0.50 with acceptable internal consistency. One sample z tests were performed to determine whether the post-test data for perceptions of 3D printing in OT relevance, knowledge, and integration significantly differed from pre-test implementation perceptions – these were treated as the population parameters [27]. This analysis was performed in lieu of the paired samples t test, as identifiers were not collected. There was a statistically significant difference in perceived relevance, $z = 2.17$, $p = .03$, $d = 0.60$. Particularly, there was a moderate increase in perceived relevance from pre- ($M = 108.73$, $SD = 14.27$) to post-implementation ($M = 117.31$, $SD = 16.96$). There was a statistically significant difference in perceived knowledge, $z = 5.27$, $p < .001$, $d = 1.41$. There was a substantial increase in perceived knowledge from pre- ($M = 28.81$, $SD = 8.05$) to post-implementation ($M = 40.14$, $SD = 7.37$). Further, there was a statistically significant difference in perceptions of integration, $z = 2.40$, $p = .016$, $d = 0.64$. Particularly, there was a moderate increase in perceptions from pre- ($M = 112.89$, $SD = 10.18$) to post-implementation ($M = 119.43$, $SD = 18.76$). This suggests that the OT students' perceptions in terms of relevance, knowledge, and curriculum integration improved after the implementation of the 3D printing course lecture and assignment. See Tables 3 and 4 for the statistical output and descriptive statistics.

Variable	α	z	p	d
Relevance	.83	2.17	.03	0.60
Knowledge	.76	5.27	< .001	1.41
Integration	.50	2.40	.016	0.64

Table 3: Cronbach's' alpha (α) and One-sample z test (z, p, d)

Variable	Time	n	M	SD	95% CI	
					LL	UL
Relevance	Pre	26	108.73	14.27	102.97	114.50
	Post	13	117.31	16.96	107.06	127.56
Knowledge	Pre	26	28.81	8.05	25.56	32.06
	Post	14	40.14	7.37	35.89	44.40
Integration	Pre	26	112.89	10.18	108.77	117.00
	Post	14	119.43	18.76	108.60	130.26

Table 4: Category Scores from Pretest- to Posttest

Note. n = sample; M = mean; SD = standard deviation; CI = Confidence Interval; LL = Lower Limit; UL= Upper Limit

Discussion

This study introduced 3D printing of self-help devices to OT students and assessed its impact to experiential learning through pre- and post-test questionnaires developed and aligned based on Kolb's ELC and TAM model. The primary findings revealed that students increased their perceived relevance, knowledge, and integration of 3D printing concepts through combined didactic and practical hands-on components of a course assignment. The students understanding 3D printing and its relevance towards its use on OT significantly improved from pre to post-test measure with the largest effect size (d = 1.41). The large effect size confirms that the entire process of the educational assignment, from 165-minute lecture on 3D printing to actual fabrication of 3D devices based on clinical cases, was successful in meeting the primary learning objectives of improving student experiential learning. The students not only received an introduction to 3D printing concepts but also learned troubleshooting strategies as they navigate the actual hands-on process of 3D device fabrication. The course assignment gave students the chance to explore various existing 3D printed assistive tools and helped improve their confidence in 3D printing. These outcomes align with Kolb's ELC, which frames learning as a progression through *concrete experience, reflective observation, abstract conceptualization, and active experimentation* [14]. In this study, students engaged in *concrete experience* by fabricating adaptive devices, *reflective observation* by assessing usability and discussing challenges, *abstract conceptualization* by integrating OT frameworks and theoretical principles into their designs, and *active experimentation* by refining devices and applying learned strategies in peer projects. The large effect size suggests that moving through all stages of Kolb's cycle enhanced students' understanding and confidence in using 3D printing technology.

There was a statistically significant difference in student perceptions of both relevance of 3D printing to OT curriculum (d = 0.60) and perceptions of integration of 3D concepts (d = 0.64). Specifically, Q16-Q19 in Table 2 demonstrates reflective observation and abstract conceptualization, as students deepened their understanding of 3D printing's clinical utility while recognizing potential barriers. Responses to these questions on the posttest questionnaire revealed that students greatly enhanced their conceptual understanding of 3D printing and its clinical application to OT and considered as useful tool in their education and future clinical roles. Additionally, Q6, Q9, Q14-Q15 in Table 2 provided a multifaceted look at students' abstract conceptualization and active experimentation, capturing how students viewed 3D printing as a tool for creativity, problem-solving, and experiential learning within the curriculum. Responses to these questions on the posttest questionnaire revealed that students favorably rated assignment content (clinical areas), met learning outcomes (skills like problem-solving and creativity), and enhanced motivation and confidence. The results also align with TAM, as student responses demonstrated growth in both perceived usefulness (PU) and perceived ease of use (PEOU), which in turn supported behavioral intention (BI) to adopt 3D printing in future practice. As highlighted in prior research, technology adoption requires both confidence in usability and recognition of value [12, 17]. This study's design addressed both by combining theoretical instruction with experiential activities, reflection, and peer presentations, thereby reinforcing both Kolb's cycle of learning and TAM's constructs of technology acceptance.

Collectively, these findings demonstrate that integrating 3D printing into OT education not only advances experiential learning but also promotes readiness to adopt emerging technologies. By engaging students across Kolb's four stages of learning while addressing TAM's determinants of adoption, the 3D course assignment provided a comprehensive educational experience that fostered innovation, problem-solving, and clinical applicability. Our findings align with Sewchuk's [15] assertion that experiential learning helps bridge the gap between what students learn conceptually and how they apply it in practice.

Implications for Occupational Therapy Education

Creating meaningful content for OT students presents distinct challenges, particularly in balancing OT foundational knowledge with clinical relevance. The course assignment was intentionally streamlined to focus on the core information OT students need to start applying 3D printing in clinical settings. In this study, the basic structure of the 6-week completion of 3D printing course assignment may be useful to develop an OT experiential learning assignment and may enhance students' perceived relevance and knowledge of 3D printing technology in entry-level OT programs.

Findings in this study indicated that in OT education it may be important to prioritize learning approaches that are highly experiential and interactive. This study may provide insight in determining where and how to embed 3D printing meaningfully within didactic and laboratory experiences, ensuring it adds value to student learning. The student responses suggested that 3D printing course assignments aligned with active learning strategies and deepened student engagement, reflection, and clinical reasoning within OT coursework. Students believed that 3D printing supports key aspects of OT training critical thinking, innovation, and client-centered application which are central to OT curriculum goals.

Importantly, OT faculty do not need to be experts in 3D printing technology to implement such assignments. Instead, they should be proficient in operating a 3D printer and knowledgeable about its application in OT practice, including benefits, limitations, and practical relevance. With this foundation, faculty can guide students in using 3D printing as a tool to support occupational performance, enhance participation, and improve quality of life for clients.

Limitations

This study has several limitations.

First, the study employed a one-group, pretest–posttest design without a control group, which limits the ability to attribute changes solely to the intervention. Future studies should consider incorporating comparison groups or randomized controlled designs to strengthen causal inference. Second, the sample size (N = 26) was drawn from a single academic institution, which may limit the generalizability of findings to other OT programs and student populations. Third, although the questionnaire was carefully designed and aligned with Kolb's ELC and the TAM model, OT students' self-report data may be subject to response bias.

In addition, despite the instructor's effort to make the pretest questionnaire available two weeks prior to the scheduled lecture, some students may have conducted preliminary readings on 3D printing that influenced their baseline responses. Difficulties with 3D printer operation also occurred, particularly nozzle clogging, which interrupted fabrication time and may have shaped student perceptions of 3D printing as overly complex. Time constraints were further compounded by limited access, as only one printer was available, highlighting cost as a potential barrier to broader adoption in OT education and clinical settings.

Finally, although this study applied rigorous quantitative analysis, it did not include qualitative methods to capture the depth of student experiences. Future studies should incorporate qualitative reflections to better understand how students perceive the impact of experiential learning with 3D printing and further examine how such learning translates into clinical practice. Additionally, exploring long-term outcomes, cost-effectiveness, scalability, and integration with interprofessional education could provide valuable insights into sustainable curricular design.

Conclusions

This study demonstrated that integrating 3D printing lectures and assignments into an OT curriculum significantly enhanced students' perceptions of relevance, knowledge, and curricular value of 3D printing. By aligning Kolb's ELC with the TAM model, the study effectively captured both learning processes and technology acceptance, showing that experiential learning strategies embedded in 3D lesson plan and OT curriculum can strengthen students' confidence and readiness to apply emerging technologies in practice. The findings suggest that embedding 3D printing into OT education provides meaningful opportunities for students to develop problem-solving, innovation, and client-centered thinking skills that are essential for future clinical practice. For future research, extending this approach to include student-designed assistive devices tested in diverse clinical contexts may further prepare graduates to apply innovative, client-centered solutions and expand the role of 3D printing in OT practice.

Acknowledgements

I would like to acknowledge the Office of Research, Statistical Training, and Technical Support Institute for their support with the statistical analysis of the data; my colleague Dr. Jennifer Yates, OTD, OTR/L for her support of my research on integrating 3D printing into the Assistive Technology course curriculum; and the Faculty Center for Teaching and Learning (FCTL) for the Scholarship of Teaching and Learning (SoTL) grant award, which supported the purchase of the 3D printer.

Conflicts of Interest: The authors declare no conflicts of interest.

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