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Application of Student-Centered Learning in User Experience to Improve Students' Interface Design Skills

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ABSTRACT

User Experience (UX) learning requires students to understand users, organize information, and create interfaces that are easy to use. However, instructor-dominated demonstrations may make learners dependent on examples, and Student-Centered Learning (SCL) in short UX courses is still rarely evaluated with measured interface design outcomes. This study examined the application of SCL to improve interface design skills in a UX course. A one-group pretest-posttest design was used with 11 participants at a private training center. Learning activities included problem selection, user-needs discussion, sketching, peer feedback, prototyping, testing, and presentation. Interface design skills were measured using a rubric covering layout, visual consistency, interaction flow, and user-centered design justification. The mean score increased from 59.00 (SD = 3.32) to 72.36 (SD = 5.92), $t(10) = 11.50$, $p < .001$, with a large effect size ($d_z = 3.47$) and a moderate normalized gain (0.33). Questionnaire means ranged from 3.82 to 4.27 on a five-point scale, with feedback rated highest and independent learning lowest. The findings suggest that SCL can support the development of interface design skills, but the one-group design and small sample (n = 11) limit causal and general claims.

KEYWORDS: Student-Centered Learning; User Experience; Interface Design; Active Learning; Prototyping

1. Introduction

General Background

Student-Centered Learning (SCL) has been proposed as a way to develop students' interface design skills in User Experience (UX) courses. Interface design is not only related to selecting colors and creating attractive screens. It also requires learners to organize information, create clear navigation, maintain consistency, and respond to user needs. These skills are difficult to develop when learners only follow software demonstrations and reproduce the instructor's examples.

In the course examined here, the pretest showed limited baseline skill: scores ranged from 54 to 64 on a 0-100 scale (mean = 59.00), although all participants already had basic experience with a design application (Section 3.1). This suggests that familiarity with design tools alone was not enough to produce good interface design, which motivates a more active instructional approach.

SCL places students as active participants, while the instructor acts as a facilitator. Learners are given opportunities to select problems, discuss ideas, locate information, create products, and evaluate their work. Sarnoto et al. [7] reported that SCL has a positive effect on learning outcomes. Emaliana [1] also explained that student-centered activities provide opportunities to develop analytical, problem-solving, self-directed, and reflective learning skills. Recent meta-analyses also report advantages of student-centered and active approaches in higher education [11]-[13].

UX learning is suitable for SCL because interface design is a practical activity that requires exploration and feedback. Students

need to create wireframes, compare alternatives, test prototypes, and improve designs based on comments. Indonesian UI/UX studies have shown that interfaces become more relevant when user needs and evaluation are included in the design process [2]-[6]. However, studies of student-centered learning mostly report general achievement [11]-[13], while UX education studies describe studio or project-based formats and student experience [14]-[16]. Few studies report measured gains in interface design skills after a short UX course using SCL. This gap motivates the present study.

The SCL procedure in this study differs from project-based learning (PBL) [17] and design thinking [18]. PBL organizes learning around one extended project, and design thinking describes a design process. In contrast, the procedure examined here specifies how responsibility is shared between instructor and learners across six short meetings and links these activities to a rubric-based measure of interface design skill. The contribution is therefore a simple, replicable instructional procedure for short UX courses, evaluated with a measured skill outcome.

This study aims to describe the implementation of SCL in a UX course and determine whether it improves interface design skills. The research questions are: (1) How was SCL implemented in UX learning? (2) Was there an improvement in interface design scores after the learning activities? and (3) How did participants respond to the SCL activities?

a. For research question (2), the hypotheses were: H0, there is no difference between pretest and posttest interface design scores; H1, posttest scores are higher than pretest scores.

2. Literature Review

[2] Kurnia and Nawaningtyas (2024) emphasized consistency, readability, feedback, and efficiency in interface evaluation.

[3] Muhaa et al. (2025) applied a design process to an educational application.

[4] Nurhasanah and Voutama (2024) used User-Centered Design for an e-learning interface.

[5] Prasetyaningsih and Ramadhani (2021) showed that UX can be measured through attractiveness, clarity, efficiency, dependability, stimulation, and novelty.

[6] Priyantini et al. (2023) developed an educational platform interface based on user requirements, showing how user-centered activities help designers understand needs and improve interface solutions.

[8] Singh (2011) describes SCL as an approach that uses authentic tasks, cooperative learning, discussion, problem solving, and learner responsibility. These characteristics are relevant to interface design because students need to make decisions and communicate design ideas.

[9] Tholibon et al. (2022) found that participation is influenced by group formation, learning activities, lecturer guidance, time, and assessment. Therefore, SCL still requires clear instructions and scheduled feedback.

[10] Wulf (2019) states that student-centered learning supports active, self-regulated, social, and situational learning. SCL focuses on what students do and learn rather than only on what the instructor explains: the instructor provides guidance and learning resources, while students take greater responsibility for planning and completing learning activities.

[11] Kozanitis and Nenciovici (2023) reported that active learning improved learning achievement compared with traditional lecturing in humanities and social sciences.

[12] Li and Ding (2023) found positive effects of student-centered education on non-academic outcomes, with the largest

effects at secondary and higher education levels.

[13] Bernard et al. (2021) found a positive weighted average difference (g = 0.34) in favor of more student-centered conditions in undergraduate science courses. Together with [11] and [12], these meta-analyses show that student-centered and active approaches are relevant to higher education, although they do not address interface design skills.

[14] Bozan et al. (2023) described UX design teaching in an information systems curriculum that combined problem-based learning, an instructor-led sample project, and team-based practice.

Based on the literature, this study combines SCL activities with UX interface design practice. Learners select a design problem, create solutions individually and in small groups, review peer work, test prototypes, and revise their designs. The literature therefore supports the expectation, tested here as a hypothesis, that interface design skills improve after SCL activities. It also shows that evidence on measured skill gains after short UX courses remains limited.

3. Research Method

3.1 Research Design and Participants

The study used a quantitative one-group pretest-posttest design. The participants were 11 learners attending a short UX course at a private training center in Indonesia. The group consisted of six male and five female participants aged 19-24 years, with an average age of 21.18 years. All participants had basic experience using a design application, but they had not completed a structured UX interface project. Total sampling was used because all members of the class participated. Participation was voluntary, participants gave informed consent, and individual results are reported using codes (P1-P11) to protect identity.

Table 1. Participant characteristics

Characteristic	Information
Number of participants	11 learners
Gender	6 male and 5 female
Age	19-24 years; mean = 21.18 years
Learning location	Private training center in Indonesia
Previous skill	Basic interface-design software use
Sampling	Total sampling of one course class

3.2 Learning Procedure

The program was conducted in six meetings, each lasting approximately 120 minutes. The instructor gave short explanations at the start of each meeting and then allowed learners to carry out most activities. Participants worked individually and in groups of two or three. They were required to explain their decisions during peer review and presentation. The activities are summarized in Table 2 and illustrated in Figure 1.

Table 2. Student-centered UX learning activities

Meeting	Student-centered activity	Main output
1	Pretest and selection of an application problem	Initial design and learning target
2	User-needs discussion and reference collection	User profile and design references
3	Sketching and wireframing	Alternative layouts and wireframe
4	Peer review and design revision	Feedback notes and revised design
5	Interactive prototype and	Testable prototype and test findings

	simple user testing	
6	Presentation, reflection, and posttest	Final design, reflection, and posttest

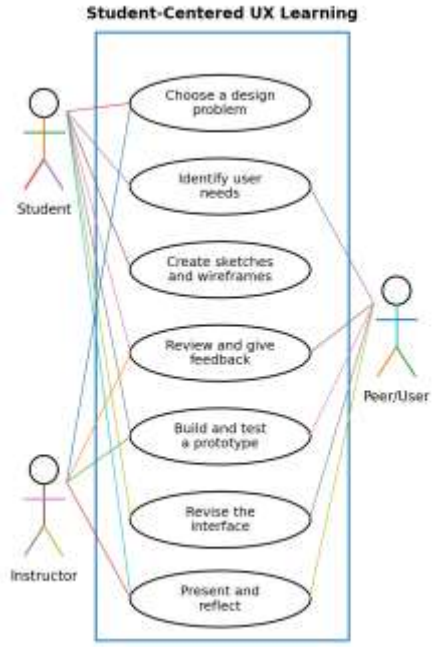


Figure 1. Use case of Student-Centered Learning activities in the UX course

3.3 Instruments and Data Analysis

The main instrument was an interface design skill rubric with a score range of 0-100. It covered layout organization, visual consistency, interaction flow, and user-centered design justification. Each participant completed a pretest and posttest by designing a simple mobile application interface from a short case. A five-point questionnaire recorded responses concerning participation, collaboration, independence, feedback, and satisfaction.

The rubric had four dimensions with equal weight (25% each). Each dimension was scored from 0 to 100, and the total score was the mean of the four dimensions. The dimensions were based on interface design principles of consistency, readability, feedback, and efficiency [2], on the user-centered design process [3]-[6], and on guidance for rubric-based assessment [19]. The indicators were: layout organization (placement, hierarchy, spacing, and alignment of elements); visual consistency (use of color, typography, and components); interaction flow (logical sequence of screens, navigation, and actions); and user-centered justification (explanation that links design decisions to user needs). Each dimension used four performance levels, from limited (unclear or incomplete work) and developing (partly clear but inconsistent) to adequate (clear and mostly consistent) and strong (clear, consistent, and well justified).

The rubric was developed from the literature above. Formal expert validation and inter-rater reliability testing were not carried out in this study. Because the instructor who facilitated the course also scored the work, scoring bias is possible. A future study should have the rubric reviewed by experts, use a second independent rater, and report inter-rater reliability with Cohen's kappa or the intraclass correlation coefficient [23].

The data were analyzed using the mean, standard deviation, gain score, normalized gain, effect size, and paired-samples t-test. The significance level was .05, and the test was used to determine whether the posttest score was higher than the pretest score. Normalized gain was calculated as (posttest - pretest) / (100 - pretest) and interpreted as low (< 0.30), moderate (0.30-0.70), or high (> 0.70) [20]. The effect size for paired data was d_z, calculated as the mean of the difference scores divided by their standard deviation [21]. The assumption of the paired t-test was checked by testing the normality of the difference scores with

the Shapiro-Wilk test, which is suitable for small samples [25]. Questionnaire means were interpreted with five-point categories [24]: 1.00-1.80 very low, 1.81-2.60 low, 2.61-3.40 moderate, 3.41-4.20 high, and 4.21-5.00 very high.

3.4 Threats to Validity

This study used a one-group pretest-posttest design without a control group. It is a pre-experimental design, so the improvement cannot be attributed to SCL with certainty [22]. History: events outside the course could affect learning; the short six-meeting period reduces but does not remove this risk. Maturation: learners may improve with time or experience alone. Testing: completing the same type of design task twice may raise posttest scores through practice. Instrumentation: the same rubric was used, but the instructor was also the assessor, so expectations may have influenced scoring. Statistical regression: extreme pretest scores were not used for selection because all learners in the class took part, and all pretest scores were in a narrow range (54-64), so this threat is likely limited. Selection: total sampling of one class means the results apply to this group only. The results are therefore interpreted as evidence of improvement during the SCL course, not as proof that SCL caused the improvement.

4. Results and Discussion

4.1 Interface Design Skill Results

The pretest scores ranged from 54 to 64, while the posttest scores ranged from 63 to 80. The mean pretest score was 59.00 (SD = 3.32), and the mean posttest score was 72.36 (SD = 5.92). The average improvement was 13.36 points. All 11 participants obtained a higher posttest score.

Table 3. Individual pretest and posttest scores

Participant	Pretest	Posttest	Gain
P1	58	68	10
P2	62	80	18
P3	55	63	8
P4	60	74	14
P5	64	76	12
P6	57	77	20
P7	59	68	9
P8	61	76	15
P9	56	67	11
P10	63	80	17
P11	54	67	13

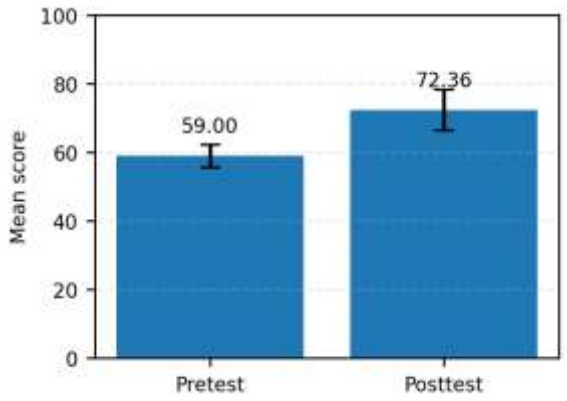


Figure 2. Mean interface design skill score before and after SCL.

The Shapiro-Wilk test showed that the difference scores were approximately normally distributed ($W = 0.97$, $p = .878$), so the paired-samples t-test was appropriate. The test produced $t(10) = 11.50$ with $p < .001$, and the mean difference was 13.36 points (95% CI [10.77, 15.95]). This means that the difference between the pretest and posttest scores was statistically significant, and H0 was rejected. The effect size was large ($d_z = 3.47$). The average normalized gain was 0.33, which indicates a moderate improvement [20]. Because the sample was small and there was no control group, the effect size is imprecise and may overstate the effect of SCL alone.

4.2 Improvement in Design Aspects

Table 4. Mean score for each interface design aspect

Design aspect	Pretest test	Posttest	Gain
Layout organization	61.82	75.45	13.63
Visual consistency	58.18	71.82	13.64
Interaction flow	56.64	70.91	14.27
User-centered justification	59.36	71.27	11.91

The largest improvement occurred in interaction flow (14.27 points), while layout organization (13.63) and visual consistency (13.64) improved by similar amounts. Interaction flow may have improved most because peer review and prototype testing (Meetings 4 and 5) directly practice connecting screens, buttons, and menus. This is an interpretation, because the study did not collect observation data to confirm the process.

The improvement in user-centered justification was the smallest (11.91 points). This may indicate that producing better screens develops faster than explaining design reasoning, so explicit practice in justification could be added to the course. This interpretation should be tested with more detailed data.

4.3 Participant Responses

Table 5. Participant responses to SCL activities

Response item	Mean	Interpretation
Active participation	4.18	High
Collaboration with peers	4.09	High
Independent learning	3.82	High
Usefulness of feedback	4.27	Very high
Overall satisfaction	4.00	High

The highest mean score was for usefulness of feedback (4.27), followed by active participation (4.18). Independent learning received the lowest score (3.82), although it remained in the high category. Because the questionnaire used closed items only, the reasons behind these scores cannot be identified from the data.

4.4 Discussion

The findings support the SCL principle that students learn through active participation and responsibility. Participants did not only listen to explanations; they selected problems, created interface alternatives, discussed results, and revised their work. This is consistent with Sarnoto et al. [7], who reported a positive effect of SCL on learning outcomes, and Singh [8], who related student-centered activities to interest, confidence, reasoning, and problem-solving skills.

Peer review was useful because interface design involves many visual and interaction decisions. Learners could observe different solutions and provide suggestions. This supports Wulf's [10] view that learning is active, social, and self-regulated. It is also consistent with Tholibon et al. [9], who emphasized group activities, lecturer guidance, time, and assessment as important factors in student involvement.

Previous UI/UX studies give only indirect support. Priyantini et al. [6], Muhaa et al. [3], and Nurhasanah and Voutama [4] evaluated application products, not student skills, but they showed that user involvement can help produce interfaces that are more suitable for user needs. The use of consistency and feedback criteria also follows the interface evaluation points discussed by Kurnia and Nawaningtyas [2].

The normalized gain was moderate (0.33), which means that learners achieved about one third of the possible improvement. Possible reasons are the short course of six meetings and the smaller improvement in user-centered justification, but these reasons were not tested. The lowest questionnaire score for independent learning (3.82) points in the same direction:

learners may still need structure, which is consistent with Tholibon et al. [9]. The paired effect size (d_z = 3.47) is much larger than the between-group effects reported in meta-analyses, such as g = 0.34 in [13], but the two are not directly comparable, because paired effects in a one-group design are affected by the strong link between pretest and posttest scores and by the absence of a control group [21], [22].

The study has limitations. The sample was small (n = 11), there was no control group, and the learning period consisted of only six meetings. The improvement therefore cannot be generalized to all UX learners or attributed to SCL alone (Section 3.4). In addition, the same instructor facilitated and assessed the learning, and the rubric was not validated by experts. Future studies should involve a larger sample, a comparison group, independent raters with reported reliability, a validated rubric, a delayed posttest to measure retention, and qualitative data such as observation or interviews to explain how SCL activities affect learning.

4.5 Practical Implementation

The implementation shows that SCL does not mean that the instructor leaves learners without direction. The instructor still needs to prepare a clear problem, explain expected outputs, schedule feedback, and provide assessment criteria. The main difference is that learners perform more exploration, discussion, design, testing, and reflection.

Table 6. Recommendations for applying SCL in UX learning

Stage	Instructor action	Student action
Preparation	Provide the case, rubric, tools, and schedule	Review objectives and identify prior knowledge
Exploration	Use guiding questions instead of giving final answers	Find references and propose alternatives
Development	Monitor progress and give focused feedback	Create wireframes and prototypes
Evaluation	Facilitate peer review and user testing	Test, revise, and explain design decisions
Reflection	Connect results with UX principles	Evaluate strengths, problems, and next steps

For a short course, the most important activities are practice, peer discussion, prototype testing, and reflection. These activities should be connected to clear outputs so that learner autonomy remains directed toward the intended competencies.

5. Conclusion

RQ1: SCL was implemented in the UX course through six meetings that included problem selection, user-needs discussion, sketching, peer review, prototyping, testing, presentation, and reflection. RQ2: The interface design mean score increased from 59.00 to 72.36, a significant and large improvement (d_z = 3.47) with a moderate normalized gain (0.33). RQ3: Participants gave high to very high responses (3.82-4.27) to the SCL activities, with the highest score for feedback and the lowest for independent learning.

The contribution of this study is a simple SCL procedure that can be used in a short UX course. The method gives learners more opportunities to practice, make decisions, explain ideas, and revise interface designs. Because independent learning received the lowest rating and user-centered justification improved the least, instructors should keep clear schedules, assessment criteria, and feedback, and add explicit practice in explaining design decisions.

Suggestions for Future Research

Based on the study's limitations, four suggestions are proposed for future research.

First, use a comparison group, such as a class with instructor-led demonstrations, with random or matched assignment where possible, to show whether gains exceed

conventional teaching and to reduce the history, maturation, and testing threats (Section 3.4).

Second, use a larger, more diverse sample from several classes or institutions to improve generalizability and effect-size precision beyond 11 participants.

Third, use independent raters who did not facilitate the course, report inter-rater reliability (Cohen's kappa or ICC) [23], and have experts validate the rubric beforehand.

Fourth, add a delayed posttest several weeks later to assess retention, and include qualitative data (observation notes or interviews) to explain why interaction flow improved most and independent learning scored lowest.

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