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Cultivating Researcher-Sensibility in Novice Designers: Exploring Genre-Specific Heuristics for Game Evaluation in a Design Studio

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Abstract. This paper presents an eight-day design studio that teaches heuristic evaluation of games to third-year bachelor students at the School of Design, Southern University of Science and Technology. Through this course, students gain the first-hand experiences of developing heuristics for games through online survey and using them in idea generation and game evaluation. 13 students (working in groups of two or individually) developed 88 heuristics for 8 game genres by analyzing 349 quotes of game reviews collected from online. The heuristics were further developed into questionnaires and tested with invited 51 game players, followed up by post-interviews. The heuristics were also used as inspirational tools to help the students generate design ideas in an ideation exercise. Results of the students' work indicate usefulness of the heuristics as evaluative and inspirational tools. In the discussion, we reflected on the challenges encountered by the students over the course and how dealing with these challenges could reveal further directions of teaching research methods in HCI studios.

Keywords: Design Education · Studio · Design Research Methodology · Design Evaluation

1 Introduction

As the field of design develops, there have been continuous efforts to investigate, reflect on and add to pedagogical approaches in HCI curriculum. A solid body of literature has provided us knowledge on how to teach design in the creative context (Cross, 2007; Davis, 2017). The purposes and formats of design education have vastly changed since the focus of design education moved from artefacts to interactions (Wilcox et al., 2019). Researchers, educators, and design practitioners have reached the shared understanding that design is a fast-evolving and multidisciplinary subject that responds to the emerging technologies, product types and users' needs and contexts (Churchill et al., 2014; Grandhi, 2015). This ever-changing nature of design and its close relationship to

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current social-technical systems bring forward the complexity to teaching complicated design skills of crafting computational things while guiding students to base their design rationale on real users' needs. Design educators face the challenge of finding suitable approaches to teaching design in classrooms. Compared to the major efforts made to guide students in making activities, less emphasis is put on the prelogical approaches to teaching research methods in studios.

This course takes the form of an eight-day studio aimed at teaching students to develop and evaluate genre-specific heuristics for game design. Over the course, students collected game reviews from various online platforms and websites which reflected design problems of specific genres of games. Based on analysis of the shared problems, students propose a set of design principles, i.e. heuristics, which indicate the good qualities of games of those genres. Students then conducted user tests of existing games using the heuristics developed by themselves. The heuristics were also used as inspirational tools in an ideation exercise to generate design ideas across different genres. As a result, students developed 88 heuristics for 8 game genres by analyzing 349 quotes of game reviews. The findings from the user tests and ideation exercise indicate potential usefulness of the heuristics as evaluative and inspirational tools. Through reflecting on students' learning experiences during the courses, we discussed the main challenges encountered by the students while adopting and practicing research methods in the studio. Our contribution to the HCI community is twofold. First, we provide an initial model of teaching research methods in a HCI studio. Second, we call for closer attention to the key elements that shape students' experiences of learning and practicing research methods in the contexts of studio-based course, opening up future discussions on how to introduce and integrate research methods as part of design practice.

2 Related Work

2.1 Teaching Design in Studios

Studio-based courses (also known as project-based courses) have emerged as the main format of teaching HCI in classrooms. The studio-based pedagogy, long established in product and architecture design, provides an active and focused learning environment—oftentimes lasting several hours each session–in which the students apply newly gained knowledge and skills to address real-world problems while instructors provide formative feedback given each student' or groups' progress (Reimer & Douglas, 2003; Schön, 1985, 1987). The studio-based teaching emphasizes the philosophy of leaning by doing: the process of gaining knowledge is closely integrated with the act of creating artefacts. Its malleability also allows for integration of other classroom activities such as lectures, classroom exercises, students' presentation, and peer review. However, introduction of the studio-based pedagogy to HCI education (or computer science curriculum) also raises other concerns and critiques. While research methods in HCI are well established–including methods on how to conduct investigative activities in formative, iterative and evaluative stages of the design process–these methods are often taught through textbooks or lectures spread over the semester, and less emphasized as the key learning objectives in design education (Wilcox et al., 2019).

2.2 Teaching Research Methodology to Design Students

Teaching design practice and teaching research methodology seem intrinsically conflicting. This has been mentioned by design educators who recognize design as a creative process, which can be hindered by provision of prescriptive methods. Some researchers (e.g., Rivard & Faste, 2012) even hold that assumptions borrowed from traditional "call-and-response or memorization-based methods" might be *irrelevant* or even *harmful* to students in the context of design education. Such a lack of attention to teaching research methodology can be due to the limited time and teaching resources over the course. While many universities do not restrict resources that can be integrated in studio courses, students are often encouraged to work independently to grasp knowledge across disciplines such as psychology, software engineering and design (oftentimes outside classrooms) (Plimmer & Amor, 2006). In the model of studio-based pedagogy, instructors' roles are often described as advisors or coaches who provide tailored consultancy to individuals. Finally, it is acknowledged that the learning objectives of studio-based courses are not necessarily in line with the pursuit of the knowledge contribution to the filed. To this point, Rivard and Faste (2012) proposed the notion of "learning reflexivity" which is the students' ability to reach a deep awareness of learning objectives and to impose critical reflection on their progress to reach such goals. According to them, the learning of knowledge by the students should not be judged by the *depth*, but the *interconnectedness* of different aspects of the knowledge.

2.3 From Design Practitioners to Design Researchers

Introducing research methodology to designers mechanically or uncritically could be problematic as well. This was noticed in 1980 by Jones, who shared the concern that overemphasis on the procedural knowledge on design might instead constrain creativity of designers:

> *"I can see, very readily, from my experience with design methods, that, when one attempts to introduce a new idea of how something should be done, it is either ignored… or, worse than that, is misunderstood and applied in a way that contradicts the original reasons for seeking a new method… Rationality, originality seen as the means to open the intuition to aspects of life outside the designer's experience, became, almost overnight, a toolkit of rigid methods that obliged designers and planners to act like machines, deaf to every human cry and incapable of laughter."* (Jones, 1980, p. 173)

Regardless of the debate on whether design should be taught with methodological approaches, we see the type of knowledge obtained by the students through hands-on creative practice, critique and reflection in the studio differ from that preprogrammed by design researchers or methodologists. This can be explained by the three types of knowledge proposed by Nagel (2014). What studio instructors can provide to the students include *propositional knowledge* (knowledge of facts), which might include concepts and frameworks explaining the phenomena from theoretical perspectives, and *procedural knowledge* (knowledge on how to do something), which can refer to the procedural guidance provided to the students on how to create artefacts and how to investigate users'

needs and impacts of the design. In studios, students might first acquire *personal knowledge* (knowledge by acquaintance) which is informed by their previous life experiences and self-discovery while confronting previously unfamiliar real-world problems. The gaining of personal knowledge forms the starting point for the students to master procedural knowledge and understand the propositional knowledge relevant to their design practices. From our point of view, it seems that the current studio-based pedagogy mainly focuses on training of design practitioners who are masters of *knowing-how*, but lacks attention to the cultivation of design researchers who not only know *how to design* but also *why design* and *what* their designs could bring about.

A new flavor needs to be added to the teaching of studios to promote the transformation for the students from a technically *skillful* designer (being able to create things) to a *sensible* design researcher (being able to perceive and articulate real-world problems and come up with design ideas to address them). To follow up on this argument, in this paper we present a case of teaching research methods to undergraduate students in studios. The design rationale and procedure of the course are explained below.

3 Methods

3.1 Heuristic Evaluation in Game Design

The course's structure is informed by the application of heuristic evaluation in games, and research on playful experiences within and beyond game design. Heuristic evaluation is an (informal) inspection technique where expert evaluators find the usability problems in an interface by referring to a set of predefined usability principles, called heuristics (Nielsen, 1995). In game design, heuristic evaluation provides a flexible and low-cost method to identify usability problems that do not necessarily require fully functional prototypes and procedural task references (Pinelle et al., 2008; Rajanen & Rajanen, 2018; Stråat et al., 2014; Vieira et al., 2019). Note that usability of games might indicate different meanings as in typical product usability. Some researchers (e.g., Desurvire et al., 2004; Pinelle et al., 2008) tend to define game usability as independent issues that are separate from entertainment, engagement and storyline. For example, Pinelle et al. (2008) described game usability as "as the degree to which a player is able to learn, control, and understand a game," which is additional to artistic issues (e.g., voice acting and visual styles) and technical issues (e.g., graphic quality and performance issues). Other researchers proposed heuristics for games oriented around engagement, fun and pleasure, which can be observed on top of functionality issues (see Korhonen et al., 2009 for a review of these works). Building on Korhonen et al.'s (2009) work, Lucero and colleagues (Lucero et al., 2013, 2014; Lucero & Arrasvuori, 2010) made the effort of developing a set of design principles to promote playful experiences that apply within and beyond the game design. In this paper, we take a broader understanding of game usability that covers any aspect that might promote or hinder positive playful experiences in games.

We choose heuristic evaluation as the research method to be taught in the studio because: (1) it serves as an introductory method to a broader range of product evaluation methods; (2) it is easy to understand and does not require too much resource beyond the classrooms. The main structure of the course is inspired by Pinelle et al. (2008) who

engaged with a bottom-up approach to develop game evaluation heuristics by analyzing game reviews from online. Inspired by this work, we encouraged students to develop their heuristics on their own by collecting and analyzing players' and game reviewers' comments from online. By doing so, we aim to keep the students updated with the latest development of games and the online community, the understanding of which could form the basis of the categorization of the heuristics. The specific agenda of the course is introduced below.

3.2 Procedure of the Workshop

At the beginning of the course, 13 students (third-year bachelor students) teamed up in 2 or work individually on eight game genres that cover the most games available on the market, i.e., RPG Games, Puzzle Games, Construction & Management Simulation Games, Board Games, Platform Games, Rouge-like Games, Party Games, and Grand Strategy Games. During the eight days of the course, the students are guided through six stages (illustrated in Fig. 1):

1. **Problem identification:** students search online for game reviews and players' comments that reflect shared "design problems" of those genres;
2. **Developing game heuristics:** students propose genre-specific heuristics by "reversing" the identified "design problems" into "design principles";
3. **Self/Pilot-test of the heuristics:** students improve their heuristics by self-testing (writing game reviews using the heuristics as outlines) and pilot-tests within the classroom;
4. **Evaluation of the heuristics:** students invite game players to evaluate a target game using the heuristics (taking the form of a 5-point scale) and interview them afterwards;
5. **Heuristics in idea generation:** students engage in an ideation exercise using the *heuristic cards* as sources of inspiration;

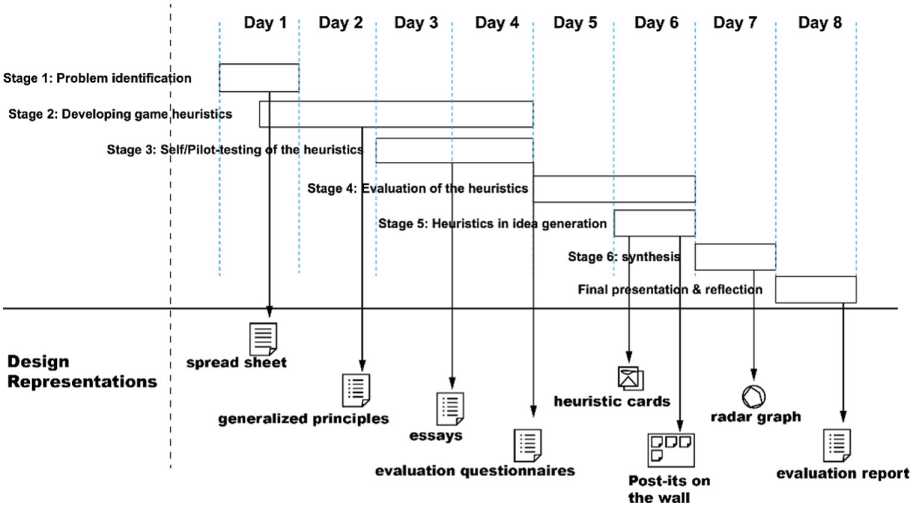

Fig. 1. Timeline of the course and the design representations used in the course.

6. **Synthesis/reflection on the results:** students summarize results of the user test and the ideation exercise and reflect on the strength and weakness of their heuristics. Students also write a piece of reflection on their learning experiences throughout the course.

3.3 Strategies to Motivate Active Learning

During the course, certain strategies were implemented to motivate active learning of the students.

Multi-modality of Representations. With representation, we refer to the design tools and methods and production of their use in the design process, with which designers externalize their design rationales, specific design ideas and vision of the future use scenarios (Bodker, 1998). Representations reflect expectations and experience of designers as they are working through design problems in the present towards solutions in the future. Note that some representations are rather descriptive which are mainly used in communication within design teams and with other collaborators (such as analysis of design problems); others are oriented towards future use of the technology and efficient to share with users and other stakeholders in the system (e.g., prototypes, mock-ups and visualization of use scenarios). In this studio, the students have engaged with different modalities of representations including spreadsheet (data sheet using Excel), generalized principles (text), heuristic cards (visualization with description), essays (game reviews), evaluation questionnaires, post-its on the wall, radar graph and evaluation report. Both textual and visual methods are used to help students to investigate and analyze the situations and to present their design ideas. How these representations are implemented along the process of the course is also illustrated in Fig. 1.

Learning by Playing. At the stage of "heuristics in idea generation" (Day 6), *heuristic cards* were created by the students, each composed of a brief explanation and a visualization of the design principle. See Fig. 2 for some examples of the cards. These cards were used as sources of inspiration in an idea-generation game. Inspired by the "PLEX Brainstorming technique" (Lucero & Arrasvuori, 2010), this game asks each player to take turns to add one card on top of each other's in the pool and try to create a narrative based on their connections (which is noted down on the post-it). The player can skip their turn if he or she is stuck. The one who empty their hands first will win. The students were asked to take the cards created by different groups. Figure 3 shows the scenarios of the students playing the game and sharing their design ideas on the wall.

Peer Observation and Discussion. In the final presentation, students tried the "peer observation & post-presentation discussion" (Fig. 4). Each group of the students was assigned as the observer of another group while they are presenting. The observer group were re-invited back to the stage together with the observed group after the final presentation and gave their comments on how well the observed group has presented their work. By doing so, each group took both the roles of presenters and observers and might gain different perspectives while reflecting on their own work and presentation skills.

Fig. 2. Examples of the heuristic cards made by the students. Left to right: the design principles that are visualized are Cause and Effect (Puzzle Games), Friendly Conflict (Board Games) and Good Storytelling (Platform Games).

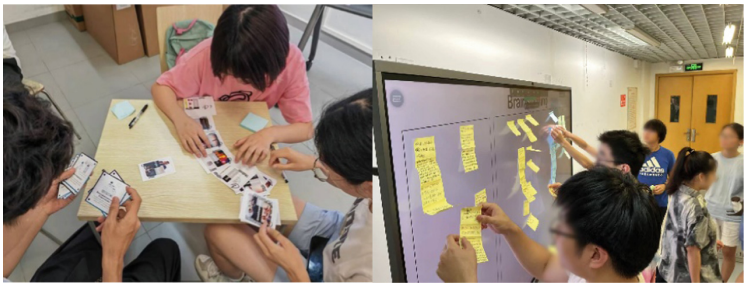

Fig. 3. Scenarios of the ideation exercise using the heuristic cards as sources of inspiration (left) and sharing the ideas through post-its on the wall (right).

Fig. 4. Students sharing comments on their observation on another group's work.

4 Results

4.1 Genre-Specific Heuristics

As a result, the students proposed 88 genre-specific heuristics generated from the analysis of 349 online reviews and comments collected from online. Table 1 shows an overview of these heuristics. These heuristics were tested with 51 game players on eight games selected as representatives of these genres. Both quantitative data (scores of the scales) and qualitative data (quotations of players from the follow-up interviews) are reported by the students. In the ideation exercise, students generated 70 initial design ideas.

4.2 Usefulness of the Heuristics

Findings from the user tests of the games using the heuristics indicated the usefulness of these heuristics to identify potential design problems and elicit insights on the experiences of games. For example, students on the group of Puzzle Games learned how unmatching background music could disrupt the experience of the game while investigating the principle of "Atmosphere and Vibe" on a puzzle-solving game with a horror style (Paper Wedding Gown 4™), to which point they shared a comment from a player

Table 1. Summary of the genre-specific heuristics for game evaluation.

Genres	Functionality	Non-functionality
RPG games	• Appearance • Action • Interaction • Sound effect • Operation • 3D view comfortability • Matching level between devices and game	• Immersive engagement • Community harmony • Task system • Achievement • Pleasure
Puzzle games	• Difficulty and complexity • Cause and effect • Guidance and feedback • Friendly operation process • Network and server technology	• Fun of puzzles • Theme expression efficiency • Reality meaning • Atmosphere or vibe • Built-in charges and Ads • Quick save and quit
Construction & Management Simulation Games	• Programming accomplishment [richness of gameplay] • Randomness control • Miscellaneous control • Inflation control and purchasing experience • Complexity balance	• Reward system • Information richness • Interaction richness • Socialization sustainability • Aesthetics, vision, and acoustics E • thical problems

(*continued*)

Table 1. (*continued*)

Genres	Functionality	Non-functionality
Board Games	• Uncertainty • Diversity of gameplay • Portability • Learnability • Reasonable duration • Good quality [of making] • Clear process • Proper visual style • [Appropriate] Level of Challenge	• Friendly vibe • Immersion of background story • Engagement • Positive emotion • Value guidance
Platform Games	• Good guidance • Proper difficulty • Good sense of manipulation • Immersive feedback	• Good story telling • Good game art • Rich game content • Diversified gameplay • Motivated exploration • Possibilities for expansion
Rouge-like Games	• Variety • Appropriate inheritance • Beauty of game pictures • Effects of striking response • Incentive frequency • Compatibility between the narrative and the game [gameplay]	• Sense of achievements • Affection fading • Proper frustration • Consolation for mistakes
Party Games	• Narrative • Virous playing mechanism • Difficulty • Participants [participation] • Content • Single-player • Balance of different players • Visual effect • Software infrastructure	• Involvement • Atmosphere • Friendship
Grand Strategy Games	• System compatibility • Game mechanics • PvE experience • PvP experience	• Learning effort • Memes [icons] in the game • Historical representation • Goal setting

in the interview: "it [the background music] does no good to its horror atmosphere, on the contrary [it] makes it quite funny." Group of Board Games discovered how the principle of "Friendly Conflict" could help identify the potential of the game to stimulate the tension among players in a positive way. They shared a quote from a player who participated the heuristic evaluation of a board game (Love Letter™): "I think it always causes conflict, for the five other players were having fun from me, but I was happy that they were having fun."

We also see the potential of these heuristics to be used as inspirational tool to generate design ideas across game genres. In the brainstorming exercise, the groups of Board Games and Rogue-like Games came up with the idea of a moral system in the game by combining the principles of "Value Guidance" and "Appropriate Inheritance":

> *"The player can take inheritance from his character' previous life for doing good. If his character does a lot morally good behavior before the character die, then he will serendipitously find his new character stronger than the previous one and get a sense of achievement."*

Students also learned about the directions to improve the heuristics and how to better use the heuristics to inspect usability issues of games. Students saw the opportunities to reorganize the structure of the heuristics, like Group of Board Games who realized that some of principles (e.g., Diversity of Gameplay and Appropriate Level of Challenge) could be grouped into a higher-level class. Many students mentioned that they need better approaches to introduce the heuristics to the players. For example, a student from Group of Platform Games shared her observation that "some participants would have his or her own understanding of the principle after just reading the title, and this led to misunderstanding… [and] some interviewees didn't know which principle they [the problems] belong to and may have different opinions." Some students were also aware that the order of going through the heuristics could affect the players' understanding of the set of heuristics. To this point, one student from Group of Puzzle Games mentioned that the principle of "Atmosphere or Vibe" could confuse people if asked at the beginning, which should be based on a general understanding of the game.

5 Discussion

Below, we reflect on students' learning experiences based on the instructor's (the first author) observation notes, the students' self-reflection by the end of the course, and collaborative reflection with colleagues. We discuss the challenges that students have encountered when developing and evaluating the heuristics, and how these challenges could inform some initial insights on how to promote active learning of research methods in design studios.

5.1 Tension Between Creation and Documentation

We recognize how the students' mindsets differ when engaged in design representations with the intention of creation and documentation. Bodker (1998) explained the dilemma regarding the use of design representations: design representations should be *sketchy*

and *incomplete* to allow for open interpretation and flexible use here and now; they need to be *complete* and *rigid* for designers to hold on to when moving towards the design implementation. As in the context of design education, similar situations are observed when students try to use methods of representations as ways to explore design ideas and at the same to document their work-in-progresses (e.g., sketching).

Through our course, we see how the design representations were adopted by the students differently due to their orientation to creation or documentation. The students seemed more enthusiastic when involved in creation, for example design of the *heuristic cards* for games. As for assignments that are to be done with strict procedures (e.g., collecting reviews and comments from online, summarizing shared design problems), some students expressed their concern about how this work could link to design. One student (Construction & Management Simulation Games) mentioned that "learning something about game survey and evaluation might not be so interesting as designing something." Making the transformation from description of design problems to creation of design is also difficult for the students. Frustration was observed among students when they were to generate new ideas from analysis of the data. We see their instinct of recognizing potential opportunities did not always end up with explicit rationale leading to specific designs.

5.2 Switch Between the First-Person, Second-Person and Third-Person Perspectives

In this course, students engaged in different perspectives to identify the design problems, investigate existing games, and come up with initial design ideas.

While analyzing design problems collected from online and reflecting on insights gained from the investigation of existing games using the heuristics, students took a third-person perspective to make sure their interpretations were based on solid evidence and justifiable. In the interviews with players after evaluation of the games, students were encouraged to follow a second-person perspective, to resonate or empathize with the player through paying close attention to the interviewees' singular experiences and asking follow-up questions, to elicit *fine grained descriptions* and *rich narratives* from the interviewees (Petitmengin, 2006). The students were also asked to write an autobiographical game review–from a first-person perspective–using the heuristics developed by themselves.

We see how integration of these three interrelated perspectives could help the students gain the sense of the dynamic characteristics of a design researcher as being *sensitive* (to their own life experiences), empathic (to the other's experiences) and *objective* (to the general audience or academic community) in different contexts. For example, the student working on Rogue-like Games reflected on his notes taken in the interviews and regretted that he was too polite and should have asked more follow-up questions. To this point, we see how the second-person perspective could get in the way when trying to collect useful data from an objective view. One student of the Board Games Group appreciated the practice of writing a game review themselves and comparing it to the results of the interview with others: "it is important not to accept the knowledge instilled by others without thinking at all. It is important to have your own ideas, and learn actively." Hereby we see the importance of the training of introspection ability of designers. As suggested

by Xue and Desmet (2019), the starting point for a designer to conduct design research should be defining the experiential distance between the designer's own life experience and that of the target users.

5.3 Dealing with Generalization and Specification

Students also faced the challenge of managing design knowledge at different levels of abstraction. Höök and Löwgren (2012) discussed how the knowledge generated from the design-oriented HCI research might vary on different levels of abstraction, ranging from specific design instances to general theories that apply across different contexts and over time. According to them, a design researcher should not only focus on present novel design work, but also engage in the reflection and articulation of the design knowledge that connects design examples to general insights or rules that can be beneficial to other designers. In the context of design education, this requires the instructors to not only involve the students in design exploration and implementation, but also familiarize them with the process of knowledge construction, i.e., how the knowledge is generated, communicated, and contested.

In our studio, students worked on both specific design examples (e.g., reviews and comments on specific games) and general design heuristics, which according to Höök and Löwgren (2012) is a typical *intermediate level knowledge* as the other evaluative tools. We recognize how the students experienced difficulties in both making abstract categorization and keeping their insights relevant to the specific context. Some students regretted that they had not made the full use of the data collected from online. One student (Party Games) admitted that he was too "subjective" when making the principles and "didn't get good use of the collected data." On the other hand, some students also found it difficult to articulate commonalities shared by the problems while at the same time making the heuristics pertain to the specific genres. For example, the group of Board Games shared the concern that their heuristics were both too detailed that they could not cover all the aspects and at the same time too vague that they were not clear to the users. Another student of RPG Games mentioned that "our design principles were too detailed and didn't highlight the key design principles of RPGS."

While reflecting on these difficulties encountered by the students, we realize that mastering the ability to manage different levels of abstraction in design research might take further individual development that goes beyond a studio course. This individual growth requires not only deep familiarity with the original contexts, but also rich understanding of the common senses and shared languages in the knowledge domain. This is especially seen in students who struggled to find the right terms that could accurately elaborate their insights, as said by a student (Platform Games): "when we were confused, we just thought and thought, but didn't try to read more to find out the solution."

5.4 Research Methods in Design as Informative Processes or Backwards Reasoning?

Last but not the least, we would like to address the point that whether research methods are needed to produce good quality design. Many researchers (e.g., Bodker, 1998; Button & Sharrock, 1994) noticed in design practice methods are not *followed*, but *made working*

in specific contexts, or even in the backward fashion in designers' minds. To this point, we find an explanation from Horst Rittel who talked about *design reasoning* in 1987:

> *"[F]rom the beginning, the designer has an idea of the 'whole' resolution of his problem which changes with increasing understanding of the problem, and the image of its resolution develops from blurry to sharp and back again, frequently being revised, altered, detailed and modified."* (Rittel, 1987, p. 2)

Following Rittel's words, we see the value of teaching research methods to design students, who might not appreciate the logic of research or even find it redundant while learning. However, introduction of research methodology to novice designers provides an anchor point in the back-and-forth between the designers' intuition and how their designs could make a difference in the real world. Such cultivation would benefit the students in the long run whether they would one day engage in design as design practitioners or design researchers.

6 Conclusion

While work exists that aims to provide step-by-step guidance to students in design studios, less attention is paid to the cultivation of researcher-sensibility that fills the gap between the education of design practitioners and design researchers. In this paper, we present a studio course in which students were guided to develop and evaluate heuristics for games of different genres. Through reflecting on the students' work and observation from the instructor's perspective, we revealed the potential issues faced by the students when learning and practicing research methods in design studios. We highlighted how, by paying close attention to the tension between the act of creation and documentation, switching between different perspectives (as the first person, second person and third person in the situation), and acceptance of design knowledge at different levels of abstraction, the design instructors could guide the students to achieve deeper learning experiences in learning research methods in studios. Our work provides some initial insights for broader discussions on how to teach research methodology to novice designers.

References

Bodker, S.: Understanding representation in design. Hum. Comput. Interact. **13**(2), 107–125 (1998)

Button, G., Sharrock, W.: Occasioned practices in the work of software engineers. In: Requirements Engineering: Social and Technical Issues, pp. 217–240 (1994)

Churchill, E., Preece, J., Bowser, A.: Developing a living HCI curriculum to support a global community. In: CHI 2014 Extended Abstracts on Human Factors in Computing Systems, pp. 135–138 (2014)

Cross, N.: From a design science to a design discipline: understanding designerly ways of knowing and thinking. In: Design Research Now, pp. 41–54. Springer (2007). https://doi.org/10.1007/978-3-7643-8472-2_3

Davis, M.: Teaching design: a guide to curriculum and pedagogy for college design faculty and teachers who use design in their classrooms. Simon and Schuster (2017)

Desurvire, H., Caplan, M., Toth, J. A.: Using heuristics to evaluate the playability of games. In: CHI 2004 Extended Abstracts on Human Factors in Computing Systems, pp. 1509–1512 (2004)
Grandhi, S.: Educating ourselves on HCI education. Interactions **22**(6), 69–71 (2015)
Höök, K., Löwgren, J.: Strong concepts: Intermediate-level knowledge in interaction design research. ACM Trans. Comput. Hum. Interact. (TOCHI) **19**(3), 1–18 (2012)
Jones, J.C.: … in the dimension of time: thoughts about the context of designing. Des. Stud. **1**(3), 172–176 (1980). https://doi.org/10.1016/0142-694X(80)90025-3
Korhonen, H., Montola, M., Arrasvuori, J. (2009). Understanding playful user experience through digital games. In: International Conference on Designing Pleasurable Products and Interfaces, pp. 13–16 (2009)
Lucero, A., Arrasvuori, J.: PLEX Cards: a source of inspiration when designing for playfulness. In: Proceedings of the 3rd International Conference on Fun and Games, pp. 28–37 (2010)
Lucero, A., Holopainen, J., Ollila, E., Suomela, R., Karapanos, E.: The playful experiences (PLEX) framework as a guide for expert evaluation. In: Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces, pp. 221–230 (2013)
Lucero, A., Karapanos, E., Arrasvuori, J., Korhonen, H.: Playful or gameful? Creating delightful user experiences. Interactions **21**(3), 35–39 (2014). https://doi.org/10.1145/2590973
Nagel, J.: Knowledge: A Very Short Introduction. OUP Oxford (2014)
Nielsen, J.: How to conduct a heuristic evaluation. Nielsen Norman Group **1**(1), 8 (1995)
Petitmengin, C.: Describing one's subjective experience in the second person: an interview method for the science of consciousness. Phenomenol. Cogn. Sci. **5**(3–4), 229–269 (2006)
Pinelle, D., Wong, N., Stach, T.: Heuristic evaluation for games: usability principles for video game design. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 1453–1462 (2008)
Plimmer, B., Amor, R.: Peer teaching extends HCI learning. In: Proceedings of the 11th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education, pp. 53–57 (2006)
Rajanen, M., Rajanen, D.: Heuristic evaluation in game and gamification development. GamiFIN, pp. 159–168 (2018)
Reimer, Y.J., Douglas, S.A.: Teaching HCI design with the studio approach. Comput. Sci. Educ. **13**(3), 191–205 (2003)
Rittel, H.: The reasoning of designers: delivered at the international congress on planning and design theory. IGP (1987)
Rivard, K., Faste, H.: How learning works in design education: educating for creative awareness through formative reflexivity. In: Proceedings of the Designing Interactive Systems Conference, pp. 298–307 (2012)
Schön, D.A.: The design studio: an exploration of its traditions and potentials. International Specialized Book Service Incorporated (1985)
Schön, D.A.: Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. Jossey-Bass (1987)
Stråat, B., Rutz, F., Johansson, M.: Does game quality reflect heuristic evaluation?: Heuristic evaluation of games in different quality strata. Int. J. Gaming Comput. Mediated Simul. (IJGCMS) **6**(4), 45–58 (2014)
Vieira, E.A.O., da Silveira, A.C., Martins, R.X.: Heuristic evaluation on usability of educational games: a systematic review. Inform. Educ. **18**(2), 427–442 (2019)
Wilcox, L., DiSalvo, B., Henneman, D., Wang, Q.: Design in the HCI classroom: setting a research agenda. In: Proceedings of the 2019 on Designing Interactive Systems Conference, pp. 871–883 (2019)
Xue, H., Desmet, P.M.A.: Researcher introspection for experience-driven design research. Des. Stud. **63**, 37–64 (2019)