Discovering IDN Authoring Strategies: Novices Anchor Choice Design Through Character Development with Player Feedback

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Abstract. Shifting from narrating in everyday life and culture to designing an IDN is a major challenge. It requires rethinking the goals and elements of narrating, with a focus on the player's perspective. Yet, we know little about student designers' IDN composing processes, such as how they use digital techniques (like branching) and develop narrative qualities, like character, to create multiple story trajectories for player engagement. Novices' uptake of devices and narrative elements, such as character and choice poetics, is a process that can inform IDN theory and practice about the shift to this new genre. This paper presents a secondary analysis of interactive digital narrative (IDN) designs and player reflections created during a 2.5-h online workshop. Detailed analyses of narrative elements and digital devices in hundreds of design and reflection sequences trace uses and developments of novice authoring strategies. Four strands of analysis (narrative elements, choice poetics, player reflection, and Twine tree structure) offer a complementary picture of the IDN design learning process. Findings of our analysis show that, over time, student designers developed characters with increasing literary quality and with sophisticated choice options (socio-emotional and moral dilemmas) as pivots for narrative trajectories. Different character and choice development patterns related to player feedback suggest the importance of integrating these multiple dimensions into IDN research and pedagogy. Discussion highlights how the analysis captures the complexity of the IDN genre, provides a foundation for ongoing research into IDN designing as a developmental process, and offers a foundation for IDN pedagogy.

Keywords: Interactive Digital Narrative Design · Character Poetics · Choice Poetics · IDN Pedagogy · Twine

1 Introduction

While a major purpose of everyday storytelling is to make sense of the world and one's role in it [1], the purpose of IDN designing is to make sense of "the other," in particular, the player as potential co-author. In that process, the IDN designer becomes "a

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narrative architect creating a "protostory," which is "a digital template with narrative and digital elements that interacting players can work with in satisfying ways to create narratives" [2]. Creating such possible stories must also, thus, be aesthetically appealing to culturally diverse others. Because becoming part of a culture involves using the culture's storytelling aesthetics, such as what makes a narrative satisfying, we highlight the processes of novice IDN designers from a wide range of cultural backgrounds. We consider how these novice IDN designers used basic digital tools (like branching in Twine), narrative elements (such as character dialogue), and social interaction (such as a player's feedback) to create increasingly crafted protostories.

Although novice IDN designers have narrated in daily life, they must make a major shift to a very different kind of narrating. Managing the shift to IDN authoring involves unlearning the value of creating a single coherent storyline and learning to create player-sensitive options for multiple possible story trajectories. While practicing this new genre, the IDN designer must do so by integrating diverse complex symbol systems (digital tools, narrative elements, and players' interactions) into a concrete playable dynamic artifact. IDN authors must, moreover, assess the quality of their developing designs from the perspective of potential players at *specific* junctures of character development and plot possibilities, rather than primarily in terms of their authorial preferences. A database of designs by a culturally and linguistically diverse group of IDN authors provides unique insights into such character and choice poetics because multi-cultural experience requires attention to multiple forms and dissonant meanings [3–5].

We analyze a database from a previous study with undergraduates new to IDN design [6]. In that practice-based study, volunteers from college social science courses met up in the Authoring-Other System in Sherlock [6, 7], which (after consent and registration) guided them through four turns of designing, playing-reflecting on a peer's design, and continuing to work on one's own design. Sherlock recorded events generated from a modified version of Twine [8] and provided them via the server to each partner, who then shared reflections to passages using a chat interface. In addition to implementing the Authoring-Other Exchange workshop, the system stored and exported the data to a database system for coding with four complementary strands of analysis [6]. The present inquiry focuses on character and choice options as mediational tools for IDN authoring, the impact of player feedback on designing, and consequences for a measure of Twine tree structure.

Following are the research questions guiding this inquiry and then a review of related literature, the methodology, results of quantitative analyses, illustrative case studies, and a discussion connecting to IDN theory and pedagogy.

Research questions guiding the inquiry include:

- How did undergraduates new to IDN authoring use narrative elements and basic *Twine* tools to create player-oriented protostories during a 2.5-h online workshop?
- What patterns of character and choice use and development occurred over time? How did character and choice developments relate to player reflections and a measure of IDN structure?
- What are the implications of mediating functions of character, choice, and player interaction for IDN theory and pedagogy?

These questions were motivated by previous research into IDN pedagogy and extend it to further explore issues of narrative content development and process.

2 Research on Poetics in IDN Genres

Much prior research on character representation in IDN has focused on connections between player and character identity [9–13] or the consequences of game design on behavior, such as aggression [14] and cognitive skills [15]. In contrast, research on IDN poetics focuses on interactive devices mobilizing aesthetic forms to engage and deepen a player's narrative involvement [16, 17]. Highlighting language use, such as with poetics, is consistent with theory about the mediational role of formal systems, like language and digital tools, in the concrete enactment of meaning in social interaction [6].

2.1 Character Poetics

Given the importance of player engagement in IDN appeal and advancement (such as for increasingly complex modes like VR), research focuses on player identity as a bridge between author and player [9]. For example, researchers are examining diegesis - such as the use of "you" involving narrator and/or player characters affecting player agency [9]. Research has also explored mediational means of player characters, such as character indeterminacy [16]. For example, one study examined "shell characters," descriptively under-determined characters in over-determined social or political roles like the border controller in "Papers Please" [16]. Players can inhabit vague characters with empathy or critical moral stances more easily than they can inhabit fully formed ones.

Another study of interactive life narratives explored altering feedback loops to help convey protagonist experiences, thereby eliciting player emotions [17]. Gameplay poetics theory emphasizes formal qualities that draw interlocutors' attention away from meaning in ways that re-ignite engagement for expansive or transformational meaning [17]. The analysis found that structuring player actions, such as disrupting player expectations of control, evokes certain emotions that engage players to form new interpretations of the narrative. Such focus on crafting form and emotion is wrought of experience that novices may arrive at slowly while working with IDN tools with players. Observing that developmental process in action could offer insights into IDN genres and pedagogy. The focal point in this developmental process is choice poetics.

2.2 Choice Poetics

Choice poetics identifies diverse conceptual options from the designer's perspective in relation to players' expectations [18]. Choice poetics theory and research posit that "choices are an essential part of poetic effects like transportation, agency, autonomy, responsibility, and regret" when relative to player goals [18]. Research applying this theory with goal-based choice analysis can "dissect a player's perception of choice," thereby offering authors and scholars a way to analyze how choices work within narratives [18]. Prior empirical research on choice poetics uses an artificial intelligence tool to implement diverse conceptual options from the designer's perspective in relation to

players' expectations as they engage with different options. We ask how novices use choice options when considering IDN authoring as a developmental process.

In addition to learning a technical device for creating choice options with the potential for multiple narrative sequences, planning for dissonance in a story may be a skill developed in multi-cultural or other challenging life experiences. Scholars who study literacy and literature development have found, for example, that attention to aesthetics occurs in multi-cultural experiences [3–5], such as among bilinguals and speakers of multiple dialects who have had to pay special attention to form and meaning as they manage communication. As Toni Morrison has explained: "If my work is faithfully to reflect the aesthetic tradition of Afro-American culture, it must make conscious use of the characteristics of its art forms and translate them into print: antiphony, the group nature of art, its functionality, its improvisational nature, its relationship to audience performance …" [4]. The uptake of IDN authoring by undergraduates from a wide range of cultural backgrounds and aesthetic traditions may, thus, be especially sensitive to multiple expressive devices, like those in interactive digital narratives.

3 Methodology

Four strands of analysis of IDN designs (narrative elements, choice poetics, player reflection, and Twine tree structure) together offer a complementary picture of this authoring learning process. Each strand of analysis has been established and tested in our previous research [6]. We drew on prior analysis of the IDN designs (narrative elements, choices, protostory tree structure) at the end of each design turn with peer playing and reflection sharing between the design turns for the present statistical analyses. Descriptive and analytic statistics (frequencies, means, Principal Components Analysis, factor analyses, and correlations) identified patterns within and across the IDN elements and player reflection categories. In addition, two qualitative case studies explored different approaches to crafting player engagement via character design and choice poetics in relation to narrative trajectories.

3.1 Database and Analyses

Data for this secondary analysis come from the study of college students working synchronously in real-time in the Authoring-Other Exchange System [6]. Data were deidentified, labeled with author demographic codes (race/ethnicity, gender, and native language), downloaded to ATLAS.ti 9 [19], analyzed with defined categories, and stored for ongoing study.

We analyzed coded data from 54 workshop participants who had volunteered through college social science courses. Based on demographics noted during registration and volunteers' declaration that they had no prior IDN authoring experience, the database represents the diversity of the large public university system; many authors identified as bi-(or tri+) lingual with native languages other than English (24 of 54) and as in diverse ethnic/racial groups including Asian (16), White (10), Hispanic (10), Black (8), South Asian (7), Middle Eastern (3), and female gender (37 of 54).

The database consists of 191 player reflection turn segments with (3 player reflection turns), resulting in 1187 expressive units (clauses, phrases, verbal emojis). IDN design data was available in text form with time stamps and Twine tool codes (e.g. [[…]] and ->) in 240 units in 4,140 expressive unit categories (sentences, clauses, phrases) over 4 design turns. The on-screen prompt for designing was "[t]hink of a story idea and use the Twine tools you learned to begin designing an IDN." The prompt provided for player reflection turns was "Share with your partner what you are thinking and feeling as you play their emerging design." After each player reflection turn, the designer prompt was "Consider your player's reflections and continue your IDN design". Figure 1 illustrates the four strands of data examined in the present study.

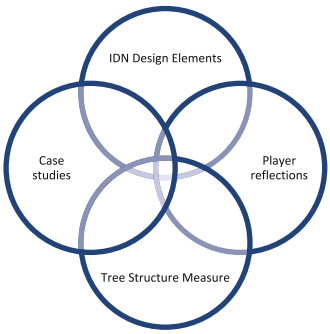

Fig. 1. Database Strands for Analysis of Character and Choice

3.2 IDN Elements

The IDN Elements analysis identified narrative qualities and choice node options, as added in each of the four design turns. Because of our interest in aesthetic forms and functions, this analysis focuses on the full range of detailed categories with attention to any prominent features and patterns. As presented in Table 1, the coding scheme identified character dynamics: character descriptions, actions, psychological states, and dialogue. Objects were also noted as described and animated. World elements included place (rooms, nature) and temporality. Character-independent events were also identified. This process yielded from 1 to 26 characters (with the character functions); 0–26 objects (with object functions).

Figure 2 illustrates how the character coding is applied using the ATLAS.ti tool.

For example, in Fig. 2 *Char1Dia* identifies the narrator, setting the scene; the "two squirrels" (*Char2Des)* who are at "a grassland beside a beautiful lake at a national park" (*WorSet).* Entering next is "one visitor stops" (*Char3Act*), who also "take a photo" (*Char3Act).*

In addition to character enactment functions, we identified character roles in narrative trajectory(ies), such as protagonist or secondary roles. The roles of characters in the IDN composing process emerged from examining the character entry point into the design, frequencies, patterns in factor analyses, interactions in choice option types,

Table 1. IDN Element Categories

IDN Element Category	Example
Character Description Character Action Character Psychological state Character Dialogue	*You* (Player character) *You trip* *You wake up* *You say to yourself "Where am I?*
Object Description Object Animation	*The wind is so strong* *The wind is blowing like it's mad*
World Setting World Setting Nature World Setting Room World Temporality	*An enormous mansion* *The woods* *The Bears' kitchen* *All of a sudden*
Event (Event) – agentless activity	*#Departure* *Bouldering is a process*
Choice: Single-dimension decision Choice: Adventurous options Choice: Socioemotional options Choice: Moral Dilemma involved	*[[The right path]] [[The left path]]* *[[You barely catch the hold and scramble to get both hands on it]] [[You miss entirely]]* *[[You ask a question]] [[You suppress your anger]]* *[[stop and see what she needs]] [[ignore again to continue your journey]]*

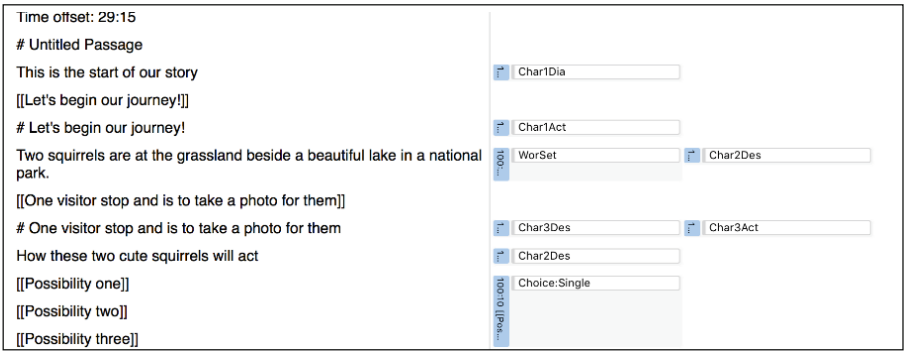

Fig. 2. Excerpt of Design with IDN Narrative Element Analysis. Passage Titles indicated with # prefix, choices with [[]].

and protostory trajectory (such as in episodes of complicating actions and/or potential resolutions). Specific character enactments designed to engage the player diegetically, such as the use of a second-person perspective, were of interest, as indicated in previous research [9]. A majority of the IDN designs used the second person "you" as a player character (35), others created non-player characters (17), and some mixed (2). As described below, the factor analysis of the IDN elements and player reflections identified inter-relationships among variables.

3.3 Player Experience Reflection Analysis

Player experience reflections identified the expressive function of shared thought units (sentence or independent clause, phrase, word, verbal emojis such as "lol") over three 15-min turns playing their partner's IDN design. As shown in Table 2 with examples, coded categories in the database: "Player cognition/intention," "Player affect," "Negative evaluation," "Positive evaluation," "IDN feature," "Repeat narrative," "Suggest narrative" "Suggest procedure/process." The eight mutually exclusive categories accounted for all the player reflections, were defined in the project manual, and checked for consistency.

Table 2. Player Reflection Categories

Player Reflection Category	Examples
Player affect: expresses emotion, subjective experience, own or other's	*I liked* *The cat purred* *It's really fun to follow along;* *The situation gave me a sense of fear* *Hahaha; lol*
Player cognition/intention: Expressing thoughts, intentions, wondering, discovering, own or other's	*I'm confused;* *I'm getting really interested to see* *She enters cautiously*
Positive evaluation: Offers positive comment on the narrative or process	*This is great!* *Good job so far*
Negative evaluation: Player offers negative comment on the narrative or process	*This isn't interactive* *should be more interactive*
IDN feature: Refers to a digital quality or feature, often in their terms	*Option* *I like your hook,* *Click the first choice…* *[[…]]* *This IS interactive*
Repeat designer narrative: Repeats a narrative sequence from the design	*how Doe sounded strange on the call;* *The person fell deeper into the cave*
Suggest procedures/process: Suggests Twine or other IDN procedure or process	*Use [[…]] to create a branch* *Add more choices*
Suggest narrative: mentions a specific narrative sequence or structure	*How will this end? Who will she choose?* *You should punish their selfishness*

Descriptive statistics identified frequencies, means, and distributions of all the player reflection categories within and across turns. Factor analyses organized the player reflection data to examine interactions with IDN elements, choice types, and the tree structure metric.

3.4 IDN Tree Structure Metric

The IDN Tree Complexity Metric (TCM) describes the size and shape of a Twine story as it appears on a design screen [20]. For this study, the TCM provided information about Twine-internal features of the designs and an independent indicator of the design structure, as perceived by experts and modeled to apply to the many design images created over time in this study. This measure is relevant to the present analysis to quantify how IDN designs included the available technical features of the authoring program. Features scraped with transcribed symbols (e.g. [[]] = choice node) from the data export files at the end of 15-min design turns included nodes, branches, leaves (nodes with no posterior links), non-leaf nodes (nodes minus leaves), choice nodes (nodes with multiple exit branches), maximum path length (path length = number of nodes connected from the origin to a leaf), average path length, and recursive branch. The TCM was developed through 2500 pairwise comparisons of IDNs, with experts comparing pairs of design images for complexity [20]. A random forest machine learning model was then built to predict a complexity metric on tree pictures outside the training sample IDNs ($R^2 = .75$). The TCM provides a single metric that captures the size and growth of the tree structure.

3.5 Case Studies

Case studies illustrate patterns of character, choice, and player reflection use in the context of a developing protostory. Screen shots were aids for considering protostory trajectory and dynamics, such as how choice options or other devices provided multiple narrative possibilities. The protostory images also indicate the design structure space captured in the TCM. Selection of the cases was also based on the authors' different strategies for player immersion, particularly whether and how they implemented player characters or other techniques.

4 Results

Analyses offer information about IDN design learning processes. The novice IDN designs include a range of narrative elements (world, character, object, events) and digital devices (nodes, branches, choice nodes, recursion, etc.). Character development and choice complexity increased over turns and in relation to supportive and IDN-relevant player reflections with some patterns of connection to the TCM.

4.1 Novice IDN Designers Took up Narrative and Digital Devices

A Principal Components Analysis of the students' uses of Twine features indicated that the participants drew on the available digital and narrative devices.

The PCA showed that 70% of the variance is accounted for by features related to the volume of the tree structure. Principal component 1 is comprised of branches, nodes, non-leaf nodes, and path length. Principal component 2, accounting for 15% of the variance, is composed of variables with a more specific emphasis on leaves and recursion. The

leaves and recursion component indicates that the size of the tree structures cannot be captured by volume alone. Moreover, the TCM offered concise evidence that the designs increased in complexity over time, based on the model with experts' judgments.

4.2 Character Rich Design Learning Strategy

While participants employed the range of Twine features available (as shown in the PCA results), the most frequently added narrative element was characters, accounting for 80% of added content (across node types). Figure 3 illustrates the frequencies of coded narrative and choice elements across turns. A common strategy was for the first character to be enacted relatively fully with psychological states (emotion, cognition, intention) and dialogue (direct quotes or reported speech). Setting elements were also relatively frequent, as was a second character with psychological states and a choice option.

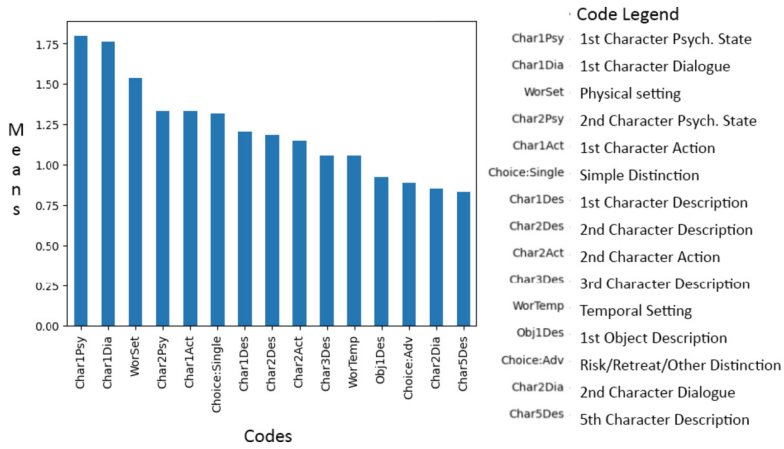

Fig. 3. Mean Values of Character and Choice Categories Overall

As shown in Fig. 3, the IDN protostories included new (choice nodes) and familiar elements (characters).

4.3 Characters Developed Over Time

To identify whether and how characters developed over the turns, we examined the distribution of basic enactments (character descriptions and character actions) compared to more elaborated character enactments (animated with psychological states and dialogue). Figure 4 presents percentages of the four character enactment functions: character psychological states and character dialogue increased over turns, while descriptions and actions decreased. We correlated basic character expressions (description and action) and elaborated character expression (psychological and dialogue) within all the IDN elements for all active design and play turns. The analysis showed basic character enactments and elaborated character enactments are inversely correlated ($r = 0.64$), indicating character development over time in the workshop.

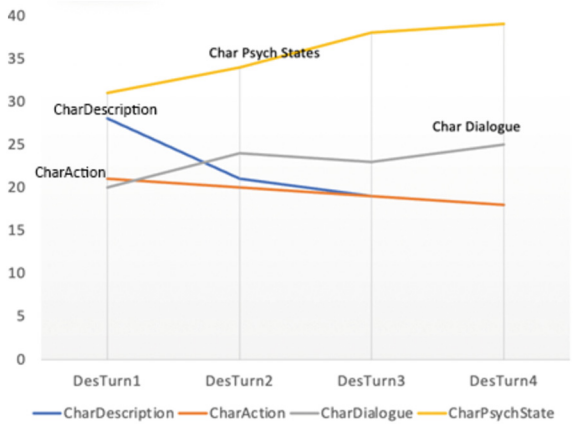

Fig. 4. Percentage of Character Enactments over Design Turns

4.4 From Character Enactments to Character Relations

Characters are not only plentiful, functional, and developing over the workshop but are also interrelated. We explored this construction of characters with interacting voices within the IDN design. If characters were forming a meaningful narrative fabric, they would interact, possibly as protagonist(s) (individual or comrades), protagonist/antagonist (hero/villain; primary point of view/secondary point of view), bystanders, or chorus. These relations can vary by frequency, time they emerge, development level, and whether they participate in choice interludes. We examined the introduction of characters by character enactments over design turns to assess such relationships among characters. Figure 5 presents character enactment over the turns.

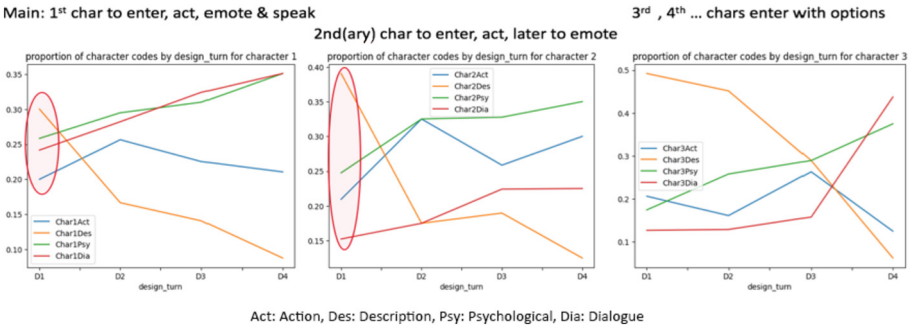

Fig. 5. Graphs Illustrating Character Roles in the IDN Designs

Figure 5 depicts the average introduction of character functions for Characters 1, 2, and 3 (as they entered the design). We observe that in the first turn, Character 1 tends to think and/or emote and to speak, as well as to be described (or named) and/or doing some action. That character is not alone, as a second enters via name or description

and less frequently by action or psychological state. A third character remains primarily described across more design turns than the first or second while perking up notably with dialogue on turn four. We learn, thus, that in addition to anchoring the early IDN experience, characters occur in dynamic relation, certainly because exploring human relations is a narrative function, but also because characters provide the salient potential for growing IDN trajectories.

A factor analysis organized the many coded variables depicting character enactments and functions. Complementing the frequency and means data illustrated above, the factor analysis offered another way to identify possible character roles and relationships, as main characters (protagonists), secondary characters (interacting as antagonists, active bystanders), and tertiary characters designed into the narrative as foils).

Non-overlapping factors explain the maximum amount of variance in the data: agentless Events (Factor 1); Characters 2, 4, 3 description (Factor 2) Objects (Factor 3); (Character 1 action, psychological state, description (Factor 4); Character 4 action, psychological state and Character 2 psych states (Factor 5). The scree plots indicate that Factor 4 captures protagonists, Factor 2 captures foils, and Factor 5 captures antagonists or bystanders.

Excerpts illustrate these character development patterns identified in the statistical analyses. For example, "The Journey Begins" depicts a protagonist with other characters entering later primarily as foils. "You" (Character 1, player) "have the day off" and Character 1 psychological state (you) "want to spend it in a fun way;" "You rack up your brain for some things to do throughout the day." In turn 3, character 1 continues to act, decide, and speak, as other characters are designed into the protostory, mostly as foils. For example, Character 2, a salesperson at "Footlocker" dialogues "asks you what type of shoe," "you would like to buy" (Character 1 psychological state). Later on, at Macy's, things get tense when "You enter the store" (Character 1 acts) "and you hear" (psychological state) new characters entering with psychological states: "a few people shouting." After a few more characters enter in various ways, the consequences for Character 1 are psychological: "You feel overwhelmed."

That pattern of a primary character who enters first in the design, with a relatively full complement of action, psychological states, description, and/or dialogue, then meets another who is described or responds minimally is a robust pattern, as indicated by the factor analysis. Case studies in Sect. 5 below illustrate some different variations of this pattern. This characterization resource, if not poetics, then interacts with the IDN device of choice to vary any individual storyline.

4.5 Choice Poetics

Like character development, choice options increased in sophistication during the IDN design learning workshop. Figure 6 shows how choice node option types changed over the design turns, with the single option decreasing (43 to 9), the adventure option decreasing less (23 to 13), and socioemotional options increasing (6 to 10). Options trading on moral decisions varied (7, 1, 6, 1).

Choice developments coincide with character development in the design titled "A Day Off." Choice types in that protostory begin simply, with choices requiring single distinctions and, gradually, over design-play turns, choices turn on more socioemotional

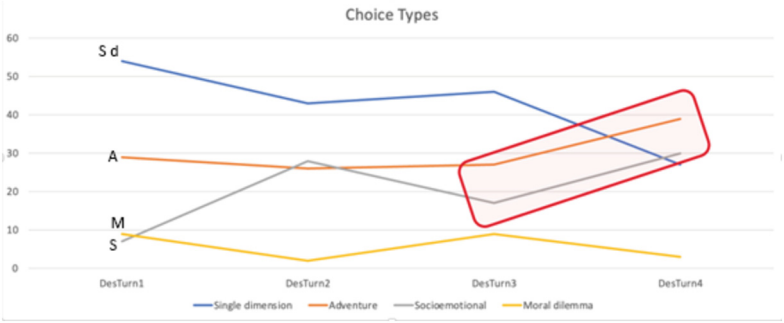

Fig. 6. Frequency of Choice Types Introduced over Design Turns

decisions. For example, in design turn 1, the narrator offers (*Char2Dia*) choices including [[Have a delicious breakfast at a small cafe->Choice 1]] or [[Go straight to the mall and grab a coffee there->Choice 2]]; [[Have a nice brunch with your family->Choice 3]]; [[Skip breakfast->Choice 4]] … [[An English muffin and black coffee]]; [[Vanilla latte]]; [[Blueberry scones]]; [[Something else entirely]]. After player reflection turns, choices become more socioemotional, such as in design turn 3 with [[SCREAMMM because it burns]]; [[Yell at the person who caused the accident]]; [[A bit of both]]; [[Demand a refund and a whole lot of tissues as you stomp out of the store]]. This pattern is also quite common.

Having described the significant character and choice design developments, we turn to player reflections, which occurred between design turns and proved to impact the designs over time.

4.6 Player Reflections Come into Play

Providing access to players during the novice IDN design process also has the potential to guide the designer with insights at the heart of IDN: player engagement. Table 3 presents the player reflection types related to changes in IDN elements, choice types, and an analysis of the TCM over time. As mentioned, the reflection prompt invited the player to share their thoughts and feelings while playing through the partner's design after each turn. Players did that with relative frequency: "Player Affect" = 276 and "Player cognition/intention" = 298, yet they also spontaneously offered other kinds of comments, as listed in Table 2. Among the other types was: "IDN feature" (155), which we expected to occur, as well as "Positive Evaluation" (115) and "Negative Evaluation" (49). As with "IDN feature," we expected that players might offer a peer struggling with the Twine tools to make procedural suggestions ("Suggest procedures/processes" = 70). Because the qualitative analysis to determine the player reflections was open to all comments, "Repeat Narrative" (161) and "Suggest narrative" (94) emerged.

The reflection type that related most often to changes in peers' IDN design qualities was "Repeat Narrative," followed by "Suggest Procedures/Practices" (Table 3). Results of the statistical analyses of the cross-strand effects (in Table 3) indicate that affirming a designer's work, especially by repeating exact sequences, made a difference in

Table 3. Player Reflection Types Related to Changes in Other IDN Measures

PLAYER REFLECTION TYPES	IDN FEATURE	CHOICE TYPES	TCM
Player Affect	-	-	**-**
Player Cognition/Intention	-	Choice: Single	**-**
Positive Evaluation	**-**	**-**	TCM +
IDN Feature	IDN Factor 4 – Main Character	**-**	TCM -
Repeat Narrative	IDN Factor 5 - Secondary Character	Choice: Single Choice: Socioemotional	-
Suggest Procedures/Processes	**-**	Choice: Adv Choice: MorDil	TCM +
Suggest Narrative	**-**	**-**	TCM +

certain kinds of design fluency and structure: creating secondary characters, that could, for example, elaborate a narrative and potential trajectories, as in the examples above. This use of choice connects significantly with the structural measure, TCM, not only as a digital feature (branching) but also in narrative quality, involving players' socioemotional decision-making. While "Repeat narrative" appears to fuel the design process, "Suggest procedure/process" also adds to structural development, as indicated in the positive correlation with the TCM and with the "Adventure" and "Moral Dilemma" choice types, which require the designer's and the player's deeper conceptual engagement. That "Negative evaluations" would be associated with stalling or shutting down the design development is not surprising. In contrast, that the design process increases with "Positive evaluation" is also not surprising but a dramatic indication of the robustness of these interacting measures.

Qualitative examinations of two designs follow to integrate these myriad findings.

5 Case Studies Showing Diverse Player Engagement Strategies

Thus far, the analysis has described how novice IDN designers approach the challenging new task of IDN designing, focusing on character development, choice offerings, and player reflections in relation to a measure of the overall tree structure. In this qualitative analysis, we further explore how students used narrative and digital devices to expand possibilities in the narrative trajectory. The tree structure measure captured growth in the overall shape of the designs, and this inquiry with Twine pictures further illuminates and examines the role of character development, choice options, and player reflection dynamics as junctures in the protostory structure.

Consistent with our consideration of how novice designers become IDN-player oriented, we chose one design (among the relatively many in this database) that invites the

player as a character with the second person pronoun "you" and another design with characters depicted within the story world (almost completely). This critical examination considered, for example, whether a choice option would have consequences for qualitatively different character interactions, such as conflicts about a journey path or social relationships, and whether different choice options would lead to different resolution strategies. The increasing TCM throughout the study and its positive relation to character and choice types points to IDN design skill as a developing process with flexibility while also showing consistent patterns like those presented above.

5.1 "The Encounter," Mediated by Player Character, Socioemotional Choices, and Peer Player Affirmation

"The Encounter" was designed by a participant identifying as a Hispanic female whose first language was Spanish. The story begins on a rainy, windy day on an island, where a plane lands with only one passenger. *You* (the player) look up, and your umbrella flies away, so you chase it, OR you almost fly away, but the person waiting holds your hand. Chasing the umbrella leads you home to sleep. The person holding your hand IS the encounter with a past love, John. The encounter reminds you of your love for John and sets off a range of self-conversation you have as "you" shift to being "Melissa." This inner dialogue is punctuated by your/Melissa's leaving John with your Dad so you can go off to your job at the clinic. John shows up as a patient at the clinic to tell you he is engaged and wants to invite you to his wedding. This shifts to a linear sequence of Melissa's self-reflections about the disappointment and, ultimately, gratitude for hearing a truth that ends the false hope of being with John. A seemingly agentless statement of truth is followed by the author presenting outside the story to thank the player for reading her story.

This design develops characters in several ways, focusing on two main characters and a foil. The story develops through the protagonist (the most frequent, most psychologically and dialogically animated, and addressed by the other characters); the antagonist former boyfriend and unrequited love interest, John (less frequent, speaking/ emoting less and often the object of the protagonist's reflection); and a bystander/foil Dad, whom John visits and protagonist leaves to tend to John (mentioned less and with less animation).

The protagonist changes and develops over time in two major ways that interact minimally with choice options. "You" are later named "Melissa," and eventually seem to be the narrator and then the author, who thanks the peer player in the end. With these changes, you/Melissa/narrator/author use self-dialogue, conversations with the other characters, and the player, as in these examples: "you think to yourself, is he going to let me go? do I let him to let me go? why is my heart beating so fast. I thought I got over John a long time ago. My face! how's my face? with the rain it must be looking awful". Later, there's "the first conversation" between John and Melissa herself: "you: "thank you so much for saving me"; Him: "Melissa? is that you? I didn't recognized you. Wow! its been like what… 10 years?" you: "oh… Hey John! Yeah, 10 years I think". From beginning to end, characterization develops, as do the choice types, although there are only a few: "Adventure": [[you flew away with the umbrella]] or [[You almost flew away, but the person hold your hand]] and "Socioemotional": He says… [[Are you okay?]] or [[Melissa?]] (Fig. 7).

How, then, does character development interact with choice poetics aspects of the design? Fig. 8 shows three choice nodes that have consequences for interactions among the three main characters: the protagonist (you/Melissa…), the antagonist (John), and the facilitator (Dad).

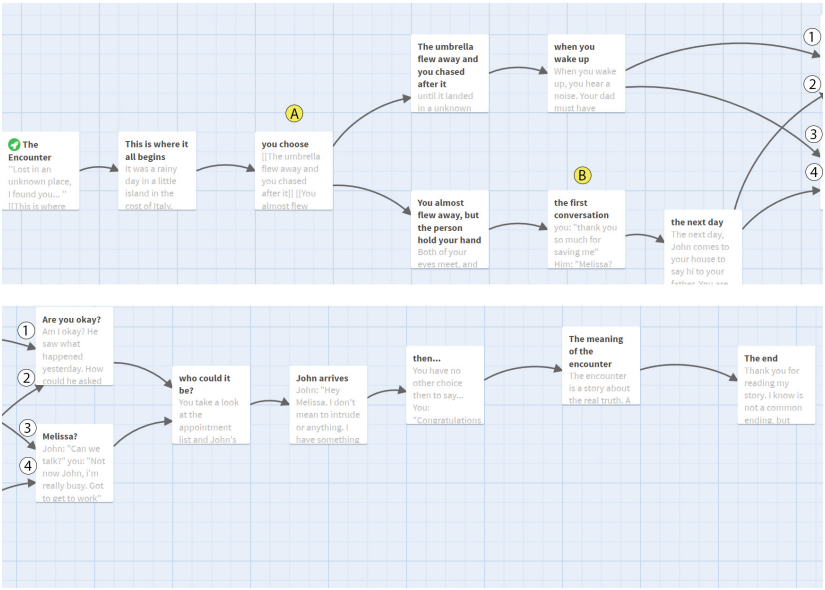

Fig. 7. Twine Tree Structure of "The Encounter" (in 2 parts for display), links numbered.

After a few choice options, the rest of the story is a linear protagonist self-conversation followed by a general statement of truth and a specific thank you to the player. A choice node on design turn 1 is "you choose" with two options: [[The umbrella flew away and you chased after it]] or [[You almost flew away, but the person hold your hand]].

On the first reflection turn, the peer player, also identifying as a Hispanic female whose first language is Spanish, asked "*who could this person be?*" as a comment linked to the passage "# You almost flew away, but the person hold your hand", as well as another another comment "*will they finally confess their feelings towards them?"* Then, in design turn 2, author implements another set of choices in design, although they provide minimal expansion of the narrative trajectory. The choice node: "when you wake up" invites the player to select [[Melissa?]] or [[Are you okay?]], as does the other choice node "the next day."

The author has used the technical feature and seems to be figuring out how to use this feature narratively, opting for a temporal marker and conversational uses of choice options. The player responds to this conversational strategy with these reflections to the passage titled "the first conversation": "wow ten years have gone by and it feels like it was only yesterday where John and Melissa had their last encounter". The player, who had been "you," now refers to Melissa by her name, yet expresses empathy, with affect

("wow, it feels like it was only yesterday…") and repeating sequences from the story "ten years have gone by," "John and Melissa" "last encounter." On the third reflection turn, the player responded to the final connection from the author to the storyline around the story, to the passage "the meaning of the encounter": "wow I really like the ending to the story because this is a realistic ending where sometimes you have to let go of someone to be happy even if it hurts."

This design draws on personal narrating abilities, the integration of some new digital literary devices and seems to serve a socioemotional purpose. Character anchors the design, beginning with a player character device and self-dialogue to create drama with questions that anticipate a story of unrequited love, which was obviously appealing to the player. The player reflections were of the kind that sparked fluency, character development, and attempts at trajectory amplification. The TCM independently identified this design as increasing in overall trajectory shape (764.5 after design turn 1, 1110.6 after design turn 2, and 1233.5 after design turn 3, where the designer and player signed off).

This design demonstrates IDN development and a foundation for student and faculty curriculum ideas. Subsequent examination of this design, possibly compared to others, provides a basis for describing what is there, what some issues might be, and what support would be needed next. While this author emphasized character development, another emphasized different dimensions of basic IDN authoring.

5.2 Emotional Engagement of Player Looking in, then Invited

The protostory design we titled "The Amulet" without an author title is by a Hispanic male whose native language is Spanish. This author's approach to character and choice development differs from "The Encounter," with consequences for potential player engagement.

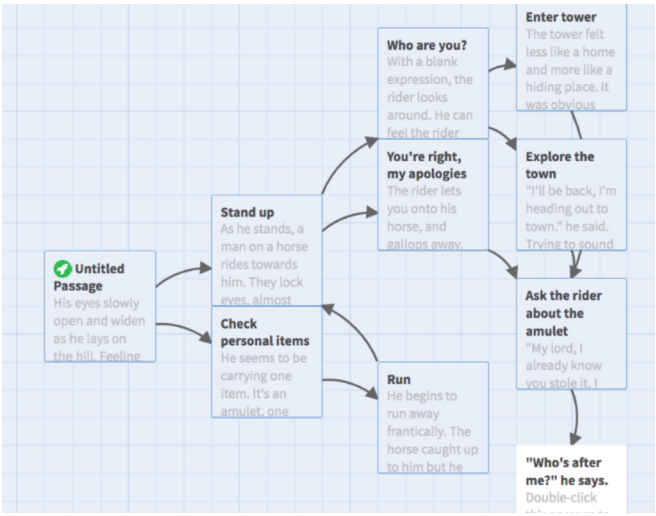

Fig. 8. Twine Tree Structure of "The Amulet"

The Twine picture in Fig. 8 shows the structure of "The Amulet." Different from "The Encounter", "The Amulet offers action-oriented choice options, such as [[Stand up to look around->Stand up]] or [[Check personal items]] and later on, [[Enter tower]] or [[Explore the town]] as well as conversational ones [[Who are you?]] or [[You're right, my apologies]]. The consequences of each also differ for the story trajectory. Options are also consequential, such as when one choice, "# Enter tower" leads to a conflict between the protagonist and the rider, who grabs his wrist reaching for the amulet, and the other, "Explore the town", leads to the rider violently smashing a mysteriously appearing hooded figure's face with a thick hammer. After the hooded figure falls back, the protagonist has his final awakening to "# Ask the rider about the amulet," finding that it has made him immortal. This design also has an increasing TCM (from 849.81 on design turn 1 to 1030.1, with a dip to 959.5 on design turn 3, and completing with 1122).

The different approaches to character and choice option development indicate the fertility of these devices for diverse learners as well as for IDN pedagogy and theory. These analyses introduce ideas about diversities and dynamics relevant to devices like character and choice, thereby adding to curricula and evaluations.

6 Discussion and Implications

This study with novice IDN designers' developments of characters and choices in relation to player feedback responds to the 2023 ICIDS conference theme is several ways. The Authoring-Other Exchange System workshop on the Sherlock platform blurs a boundary between beginning and experienced IDN designers and between the resources they bring to this fascinating complex creative genre. We asked students with no prior digital authoring experience to jump in as designers with exposure to a player, and they did. We also assumed that the undergraduates from the urban public university serving mostly ethnic/racial minority and bi-(tri+)-lingual students would bring resources especially relevant to a multi-symbolic aesthetic activity, like IDN designing, and they did.

Our workshop design included player engagement after design turns, and, as we learned in a previous study [6], that assisted novice IDN designers in positive ways. That these student designers used newly acquired digital devices to develop the quality of choice options from those involving more basic distinctions (here or there) to those involving more complex distinctions (hope or accept) while also animating characters to increase IDN narrative trajectories is remarkable. Although branching is only a first and basic device for taking up player-oriented narrating, these novice designers did so quickly and interactively with at least two other symbol systems – literary character and player subjectivity. Among numerous other possible uptake strategies, designers might have reduced character development while learning to use a digital mechanic and might have stuck to only simple choice options while taming the overall narrative structure. Making this learning process visible indicates that interactive digital narrative can build on prior narrative genres, with the introduction of a digital device to anchor the development of this complex conceptual/procedural system. In addition, the authors' different choice poetic strategies, such as one turning on character poetics and the other on action sequences, indicates the need to represent the IDN system with varying approaches.

IDN designing is, thus, a composing process and learning process to explore further for insights about theory and practice.

We learned with this quantitative and qualitative analysis that character and choice devices can anchor IDN design learning and that player interactions nudge peer authors to develop and provide bridges as well as foundations for ongoing authoring skill development. Analyses of interdependent strands of the IDN design process—narrative elements, digital devices, player engagement, and complex (non-linear) protostory construction – reveal shared and diverse design strategies. For example, some people used choice options to elaborate character development and character interactions, while others used choice options to expand possible story trajectories, such as with different conflicts, turning points, or resolutions. These and other approaches were fueled by player interactions and contributed to the growth of the Twine tree structure. With this systematic unification of four robust strands of analysis, we urge others to apply the workshop and analytic tools for future research projects with different IDN author groups, research questions, instructional time, and resources. Such future research can also offer validity checks and expansions of our methodology.

Patterns of character and choice poetics add to ongoing discoveries in the IDN field. For example, as highlighted in the diverse character enactments in the case studies as well as in the overall pattern of findings, players are engaged by diverse forms of character development, not only or primarily via identification with player characters, such as with "you." Consistent with other choice poetics research, we found that the development of choice options related to player feedback in terms of encouragement and other supports rather than to any apparent one-to-one matching of players' stated preferences/expectations for certain kinds of choices. Of course, a deeper understanding of IDN aesthetics will benefit from ongoing collaborative research.

We add to IDN pedagogy research [21–23] to suggest that a learning-by-doing introduction to authoring sets a foundation for subsequent examination by faculty and students themselves, as evidence of what they can do, what can't yet do, and insights about how they could advance their skills. In terms of poetics, these analyses indicated increasing attention to synergies of narrative and digital form. Prior linguistic and cultural resources come into play, including for students whose life histories may have prepared them especially for such poetics. Finally, because IDN integrates diverse kinds of functional symbolic tools, including digital mechanics, narrative elements, and expressive interaction, understanding how people learn this complex genre advances study of the mediated mind in human development and education research, as well as in IDN design pedagogy.

In summary, students' rapid uptake of a few digital tools (creating passages and linking options), sometimes seemingly spontaneously and at other times with the nudging of a player, anchored the development of characters and an increasingly complex story trajectory. As we stated at the onset of this article, IDN designing is a major challenge, yet the fact that it is so complex and, thus, can build on prior experience with language and social relations also makes the shift feasible and flexible. Including student designers as co-researchers with their teachers reflecting on their own beginning designs will further blur the boundary between research and practice.

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