

NewSchool: Studying the Effects of Design Fiction through Personalized Learning Scenarios

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ABSTRACT

We present two design fictions about future online learning environments, inspired by future scenarios presented in the learning analytics literature. The design fictions explore specific aspects of this future technology, its adoption and social consequences. We use Symmetry Theory to analyze the design fictions in terms of the relationship between the readers of the fictions on the one hand, and the fictional characters and technology, on the other. We argue that these relationships determine to what extent a design fiction can stimulate the reader to reflect on the future technology. As such, we present Symmetry Theory as a useful tool to analyze how an existing design fiction can stimulate reflection, and to plan the writing process of design fiction.

Author Keywords

Learning analytics; design fiction; audience effects.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

TWO FICTIONS, TWO PERSPECTIVES

Evaluating NewSchool

Joe's English teacher, Richard, opened the door, and seemed surprised to see Martha. There was another man sitting in the classroom, working on a laptop, but didn't seem to notice her entrance.

"Oh, it's you", Richard said. "We expected your son."

"Well, he has fallen ill this evening." Martha replied.

"Hmm," the teacher looked doubtful for a moment. "We are conducting these interviews to evaluate the NewSchool online learning platform with our students, so I am not sure whether this will work as well. Why didn't you call?"

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"My husband wanted to call, but I thought that maybe we didn't need to waste your time. So I came, as I thought it wouldn't make that much of a difference. He had his appointment today, and I would hate it if you wouldn't be able to conduct your study because of people cancelling their appointment. And after all, I have seen Joe use the NewSchool platform at home." Martha hoped that would convince the teacher, so she didn't come all the way there for nothing.

The teacher nodded. "Well, Martha, as you are here now anyway, please take a seat. Would you like anything to drink?"

"No no, don't mind." she said politely.

"Well, there is chocolate, enjoy yourself." Martha looked at the bowl full of chocolates. It was tempting, but the last thing she wanted was to look like she came here for the free chocolate. So she was not planning to have any.

"I leave you with Mr. Lee, who will conduct the interview, I'm in the classroom next door if you need me."

Martha nodded, and saw how Richard closed the door behind him. She was alone in the classroom now, together with Mr. Lee. He had a stern look, which made her feel insecure. Why couldn't Richard stay?

"So, Martha, right? I don't know what Richard told you about this study?" Mr. Lee asked.

"Not much, really." She wondered whether he should have. By now, she regretted being there. Sitting at the small school desk as a mother only made things worse.

"Perfect, then I'll start with giving you some information about our goals. Today, we are evaluating NewSchool, and how students use this new online learning platform. So it is important for you to know that we are not evaluating you, nor me or the platform, nor your son, or even the school. I'll ask you some questions about the platform, which I would like you to answer as honestly as possible. That is the best way for us to get the most useful feedback out of this study. We normally do this with students, so I'm not sure how this will work out, but let's give it a try."

Mr. Lee arranged his papers, and started his interview.

"Would you say that NewSchool changed anything for you or your son?"

Martha nodded enthusiastically. “Definitely, my husband and I had so much difficulties getting our boy to do his homework. There were fights every night, at the dinner table. We were so hopeless, but luckily, NewSchool changed all of that. Really. Somehow, our boy is really captivated by NewSchool, we never have to force him to do his homework again, he always does what he is supposed to do, I guess.”

“So, would you describe your experiences with NewSchool as rather positive?”

“Yes, very much so.” Martha felt confident, these questions were easy to answer.

“And Joe is a regular user?”

“Sure”, she smiled.

Mr. Lee typed something on his laptop. Then he paused, looked up, and pointed to a futuristic-looking, helmet-like device, lying next to his laptop.

“And how does he feel about the BrainBand?”

Martha shifted uneasily on her chair. “Uhm... Well, he does his home work in his room, so I don’t always know...” Actually, the only thing she knew about this device was its price tag. They hadn’t been able to purchase it yet, although the school really insisted on doing so.

Mr. Lee smiled. “But he must have told you something about the BrainBand? A lot of people are talking about measuring students’ concentration levels with this little device in order to improve their studying efficiency. It’s even been on the news.”

Martha looked at the device. Two days earlier, she saw a similar contraption on the TV news. Indeed, the news item had something to do with the use of EEG tracking to monitor concentration and track the students’ progress.

“Well, I don’t think he really minds wearing it, ” Martha said. “But anyway, he probably hasn’t used it for long enough to be able to judge its merits,” she parroted the news item.

“Well, you’re probably right about the length of the study,” Mr. Lee nodded. “But in general, you do feel like his performance improved?”

“Definitely, we never find unfinished homework in the house since NewSchool.” In fact, she wasn’t even lying about this.

“Well, that’s nice to hear. And what about your Joe’s pedagogic parameters? As we included them in NewSchool’s educational dashboard, to what extent does this tool support you as a parent?”

“To be honest, I’m not that much into computers. My husband is much better at these things. But he does seem happy having it. After all, all means to track Joe’s

performance, and help him with his school work are welcome, isn’t it?”

“Well, of course, it’s not always easy to interpret the data on such a dashboard correctly – you should be careful with that. But I suggest we take a look at it together. Let me find Joe’s predicted path.”

A popup screen appeared on Mr. Lee’s laptop. “Hmm. Error 3515. Let’s try again.”

And again, the same error showed. Mr. Lee had to call his colleagues as he had not seen error 3515 ever before, and didn’t know how to solve the issue.

As Mr. Lee put down his phone he looked at Martha. “Well, Martha, as there is hardly any usage data of NewSchool, it is impossible for us to let our algorithms do their work...”

Martha felt her face turning red. “But... How come?” she asked.

“It basically comes down to the fact that your son doesn’t use the platform, really. Well, knowing that, I don’t think I have any further questions for you. Do you have any questions you would like to ask me?”

“No, not really.” She paused. “Were my answers OK?”

“As I said, We don’t test you, we evaluate the system.”

“Oh. What about the free NewSchool subscription for one year? It was mentioned on the poster...”

Mr. Lee smiled. “From today’s interviews, we will select a number of participants for a long-term evaluation study. I can’t say anything about that at this moment yet, the recruiters have to balance demographics. But I will write down that you are interested.”

As Mr. Lee had already stood up, Martha didn’t really believe he would. John, her husband, was probably right: it might have been a foolish idea to register in Joe’s name. But it was worth the try. The only real effect of platforms like NewSchool she was aware of, was that they raised school bills considerably.

While Mr. Lee was getting Richard, Martha couldn’t resist and took a chocolate, or two.

NewSchoolGate

“You did *what?*”

Mom nearly choked on a piece of broccoli. It was dinner time, and I just told her that the school’s headmaster had threatened to expel me from school that day.

“Yeah, but it wasn’t supposed to be like this. It was just...”

“It was just *what*, Nick? A game of massively multiplayer *fraud*? A first-person swindling game? *What* was it?”

I sighed and looked down at my plate. I suddenly noticed that one of the potatoes on my plate had a striking

resemblance to the bald, asymmetrical head of my math teacher, an idiot looking 'like the toad, ugly and venomous'. Gotta love those Shakespearean insults our English teacher taught us.

But anyway, it really wasn't supposed to be that way. It started out as a goofy idea between Jack, my school buddy, and me. With the new online school platform, cheating was becoming increasingly difficult, impossible almost. Tracking your online learning behavior, and even matching that to the output of the new BrainBand, an EEG tracking device monitoring your concentration levels and God knows what else. The school teachers make us wear those futuristic, weirdo headbands "to track our progress". It's for our own good, you know.

"It's just that the entire online school system is stupid. It's made for retards. Clearly, they must think we're all morons. Well, God knows some of the guys at school are, but... Jesus, really. We're not *that* stupid."

Mom looked at me, intently, with a subdued anger.

"So a stupid learning environment suddenly is reason enough to start scamming the entire system?"

"No, but... OK, let me tell you. Jack and me, we were thinking that it used to be so easy, up till now. Forgot something? Just copy someone else's homework on the bus to school. Quickly read other people's notes during lunch break, because you forgot to prepare for a test. With the BrainBand, they know *everything*. Everything you did, or didn't do. And then,..."

"Come on, Nick, you know that..." my Mom started.

"No Mom, let me finish. You and Dad, you also had the chance of cheating just a little bit with homework and tests when you went to school, didn't you? Now they just impose a big brother tracking system on everyone, and act like it's normal. The people that made the NewSchool environment don't even know what it's like to be tracked all day. If they did, they wouldn't make up something like that. Or they would make it different, I don't know."

I went on, ranting about the online NewSchool learning platform that started everything.

"And then I didn't even mention the gamification. That's the part where things get really debilitating. I mean, really, do they actually think they can motivate us by giving us a 'Math prodigy' or a 'Cartesian hero' badge? A 'Gatsby Genius' achievement for English? I mean, *really*."

"OK, it's one thing to have a boring online system, but still, it's there to help you out! If you just accept it, it can offer you personalized learning content, with the right difficulty level. God, Nick, it was made to save you some time, and to prevent students from getting frustrated with school work that is too hard and too boring. So why can't you embrace it? And how on earth did you end up almost getting

expelled? You're still not telling me..." my Mom started again.

"Yeah, that's a load of marketing BS, isn't it. I can imagine that if they repeat that personalization crap over and over, they'll start to believe in it themselves. Dumbasses. But the fact still is that it used to be easy to cheat if you needed to, but now, they need to know every last detail about our homework effort – or lack of it, whatever. Do you have any idea how demotivating it is to have teachers whine at you every single time you spent a bit too little time on your school work? Even if you were practicing for other school-related stuff, like the school band? And I'm really not the only one in school with that opinion. The nerds just get scared of missing stuff, and spend their entire *lives* working for school, while the rest... well, they just get angry, fed up, or they just stop caring. School has *changed*, Mom. The first time I got a remark about my homework preparation time, I was like, OK, but by the third time, I thought that teachers should just go off and f..."

My Mom quickly intervened before I started using four-letter words. "Yeah, I noticed your grades have been going down the last few weeks. But you shouldn't put too much time into the school band, your school work should come first, you know that."

Suddenly, she looked sad.

"But just when I thought things were going better again. Your grades were up again. I mean, how did you..." Mom sighed. Her anger seemed to turn into sadness "... get yourself almost expelled? Really, what did you do to deserve *that*?"

It was time to come clean.

"Well... We decided to start our own little project – just for laughs, really. We were thinking how we could trick the system. It was like our own little science project."

Mom looked annoyed. She continued eating in silence.

"It was kinda fun. Looking up stuff about BrainBand, figuring out how it works, what it tracks, and how the data is combined with online behavior log data. Geeky stuff, but kinda cool when you get into it. It took us a few weeks to test some stuff, and get a feel for how BrainBand works with NewSchool."

Mom looked up, bewildered.

"You mean you actually got Jack to work on something for longer than ten minutes? The guy with the attention span of a goldfish, like you always say?"

"Unless it's about GTA 5. Or Miley Cyrus, of course. But that one, yes."

"So what did you..." she muttered.

"It was like a quest. You know, like breaking codes in a game. Trying to crack it, and get in. Cheat the system.

Eventually we found out that the BrainBand isn't all that accurate as they say it is. If you just do some kind of thinking activity, it's enough to let it think that you're making your homework, or studying. When you look at its output, anyone can see that it's really not the high-tech miracle they want you to believe."

My Mom's anger seemed to have faded, and moved from some kind of sad resignation to curiosity.

"So, you were doing other stuff while the computer thought you were making your homework?"

"Yeah, Jack found out that as long as you don't get too excited, Minecraft is good to make your BrainBand think you're doing math – especially geometry, of course. Once he found that, it was kind of easy to think of other possibilities: Age of Empires works for history and even geography, and just about any MMO can do the trick for English."

"So you were always playing games when I thought you were making homework?" Mom tried to look disapprovingly, but I saw she seemed really curious and amazed. "And then your teachers learned about your little scam."

"Well... First of all, Jack and I don't think of it as a scam. We're like a small school version of Anonymous, you know. Hacking for good. And besides, in trying to find out how to hack into NewSchool, we did learn a lot about how that stuff works. We were getting really deep into the system, and we hardly talked about anything else, anymore. But then some of our classmates overheard us talking about how we were linking games to NewSchool activities, and how we tampered with time stamps in our browser to make stuff match..."

"...and of course they were interested." Mom added.

"Of course. And now, I think about half the school knows..."

"Half the school is playing Minecraft instead of making their homework?"

"Maybe. I'm not sure – it's hard to tell from the BrainBand data whether they're doing math or Minecraft. Some kids probably play Minecraft, now. Maybe even most of them. But anyway, that's not the point. It's not that every teacher is against me now – the cool ones also don't like NewSchool. Like my English teacher, he says that it's about time that teachers start teaching again, instead of relying on numbers and some robot to feed exercises to students. Hell, the physics teacher even complimented Jack and me on our programming skills."

We sat silently for a while.

"Well, at least there's that," Mom said. "As long as you don't get the NSA on your back, I guess you can always get a career as a software developer."

INTRODUCTION: FUTURE LEARNING ANALYTICS

The two future scenarios presented above were inspired by a paper by Ferguson and colleagues, presented at the 2016 Learning Analytics and Knowledge Conference [6]. In it, they present eight different scenarios for learning analytics in 2025. The scenarios were based on a 'Policy Delphi'. Using this approach, the authors want "to explore or expose underlying assumptions or information leading to differing judgments on learning analytics, and to correlate informed judgments on the topic of learning analytics" (p.2). In other words, the Policy Delphi method was not used to seek consensus, but rather "to understand diverse views of the preferred future." (p.2)

In the remainder of this paper, we will first describe how the scenarios by Ferguson et al. provided the inspiration for the design fictions in the first half of the paper. Afterwards, we use the two fictions to reflect on the effects design fiction can have on its audience.

Situating the Original Scenarios

The eight scenarios were the output of the first phase of the Policy Delphi, in which they used the expertise of a consortium of experts to develop visions for the future of learning analytics. Each of the eight scenarios focuses on one specific aspect related to learning analytics (e.g., personal data tracking, control over personal data). The paper explicitly identifies the form of each of the scenarios:

Each of the scenarios begins with a short summary and then briefly contrasts the situation in 2015 with the envisaged scenario in 2025. The body of the scenario sets out this vision, and some of its possible implications, in more detail. ([6], p. 2)

Based on this template, the scenarios are very similar, both formally and in length (150-200 words). Scenario 1 provides a clear example of this uniform structure: it is described from the point of view of an omniscient narrator who tells about evolutions in learning analytics in an objective language:

In 2015, learning analytics were mainly used to support online learning. By 2025, they can be used to support most teaching and learning activities, wherever these take place. Furniture, pens, writing pads – almost any tool used during learning – can be fitted with sensors. These can record many sorts of information, including tilt, force and position. Video cameras using facial recognition are able to track individuals as they learn. These cameras monitor movements, and record exactly how learners work with and manipulate objects. All this information is used to monitor learners' progress. Individuals are supported in learning a wide range of physical skills. Teachers are alerted to signs of individual learner's boredom, confusion, and deviation from task. Teachers and managers are able to monitor social interactions, and to identify where they should nurture socialisation and cooperative behaviour. ([6], p. 2)

However, despite the formal similarities between scenarios, the content is very different. A content analysis showed that, for instance, while scenario 1 (cited above) almost exclusively mentions technological possibilities and functionalities to facilitate specific learning analytics goals, scenario 3 does not mention technological possibilities, but exclusively mentions societal views (e.g., ‘courses that are automated by analytics are seen as inferior’ ([6], p.3), policy, and government regulations. In other words, while they all share the same formal characteristics and objective narration, some of the scenarios focus on technological improvement (scenario 1), some present a positive learning analytics future (e.g., based on the technical possibilities of open standards – scenario 5), some a negative future (e.g., based on societal views – scenario 3).

Using this analysis of the scenario characteristics as inspiration, we set out to think about alternative representations of this set of ideas in the form of design fictions. Which content presented in these scenarios could be represented in the form of design fiction, and what would the added value of design fiction be, compared to the scenarios? This reflection on the effects of design fiction contributes to the current literature on design fiction, in that it helps in clarifying the relationship between reader (viewer), characters and prototype. Making the relationship between reader, characters and prototype explicit in an analytic framework allows for an analysis of the potential effects of design fiction. Insight into these potential effects can, in turn, help researchers in constructing purposeful design fictions that reach the authors’ goals.

RELATED WORK

While research on design fiction is currently gaining momentum [2] researchers are still exploring the possibilities of design fiction, with published research exploring several areas relevant to design fiction. For instance, Lindley et al. [12] have identified three main areas of research concerning design fiction:

- Studying the process of creating a design fiction;
- Studying how an audience interacts with or perceives a design fiction;
- Studying the content of a design fiction.

Indeed, several papers have been published on the content of design fiction, creating typologies, discussing the poetics of design fiction, and exploring specific forms (such as academic abstracts [2]). There is discussion about effects of design fiction, with researchers asking to what extent a description of a plausible, fictional world can be useful in sparking debates about specific issues [16]. However, Lindley et al.’s classification is not exhaustive: other aspects are being discussed, such as the place of design fiction in relation to other HCI methods [2], or the use of design fiction to think about specific design spaces [4].

In Lindley et al.’s classification, we use the two learning analytics design fictions to focus on the second area: how

can an audience interact with, or perceive a design fiction? In other words, how can design fiction work as a method for envisioning the (social, political, personal,...) consequences of new technologies [17], and effectively communicate these consequences to an audience? Furthermore, building on this audience effects, we ask how design fiction can be constructed in order to present a ‘critical’ point of view [11], in order to make readers reflect on their own positions. Insight into these issues can help design fiction authors in constructing purposeful design fictions that reach the authors’ goals.

CREATING THE DESIGN FICTIONS

As Blythe pointed out [2], there is no easy equivalence between scenarios and fictions: for instance, “a scenario is part of a process, a fiction exists in its own right”. Indeed, the scenarios by Ferguson et al. are an instrumental part of the Policy Delphi process, whereas a design fiction on learning analytics should be more self-contained.

A first step in the process of creating the design fictions was to envision a ‘diegetic prototype’ [10], a depiction of a future technology that figures in a fictional narrative. We combined a number of elements from various scenarios by Ferguson et al.: gamification, as a specific implementation of a way to motivate students based on their cultural characteristics (scenario 8), a device – in the form of a head band – to track attention, stress, and some other parameters (scenario 2), and the use of analytics as a valuable management tool for teachers to track their students’ activities and success (scenario 6).

A second step in creating the design fiction was to move beyond the cool, rational scenario descriptions as presented by Ferguson et al. This move was critical in developing the design fiction as an effective communication tool to get a specific message across. In order to make the design fictions more personal, we started from familiar settings (for HCI researchers): an interview between researchers and a respondent (*Evaluating NewSchool*), and a dinner table conversation (*NewSchoolGate*). On this level, the design fictions were also designed to include some ‘social’ aspects from the scenarios. For instance, *Evaluating NewSchool* includes aspects of scenario 1 (additional devices to monitor the learner, i.e., the BrainBand), scenario 4, (who is allowed to see and interpret the data), and scenario 5, (the (lack of) availability of online learning systems). In *NewSchoolGate*, aspects of scenario 1 (the BrainBand) and scenario 3 are included (Nick as one of the first learners that realize ‘that they can game the system’). Implicitly, Nick already hints at the larger conclusion of scenario 3: the fact that ‘the move away from learning analytics is not only ethically desirable [but] it is also educationally effective’. In this way, the use of design fiction opens up the possibility to include social and political conflict in thinking about the learning analytics design space 3 in a more captivating and interesting way.

STUDYING THE EFFECTS OF DESIGN FICTION

In the first part of the paper, we presented two fictions based on a common diegetic prototype. The purpose of this exercise, besides juxtaposing different views on the social consequences of a specific type of technology, is to explore the effects of design fiction. What can design fiction *do*? What can be its added value, compared to e.g. scenarios like the ones presented by Ferguson et al.?

Constructing Relationships in Fiction: Symmetry Theory

In the 1940s, Fritz Heider developed Balance Theory, a social psychological theory of attitude change [8]. Heider's theory starts from the assumption that people want to maintain psychological stability in their interpersonal relations, and that they form a balanced system of relationships between people and/or objects in order to achieve this stability. In the 1970s, Newcomb adapted this theory to Symmetry Theory, moving beyond attitude change to include 'communicative acts' in general [13].

While relationships between people, objects or events are inherently complex, Newcomb's Symmetry Theory simplifies these relationships, and characterizes individual relationships within a 'relationship system' as either positive (+) or negative (-). Following this characterization, Figure 1 presents two 'relationship systems'. Given a relationship between three persons Alice, Mary and Charlotte, the left part of Figure 1 shows a balanced system. Both Mary and Charlotte are opposed to Alice: in their opposition to Alice, Mary and Charlotte agree. As such, a higher-order entity Mary-Charlotte emerges, united in its opposition to Alice. Here, the relationships are balanced: the system of relationships will seem to be "at rest" [13].



Figure 1. Balanced (left) vs. unbalanced (right) relationships between Mary, Alice and Charlotte.

The right part of Figure 1 presents an unbalanced system of relationships. The positive relationship between Mary and Charlotte creates an entity Mary-Charlotte which has a positive relationship to Alice (through Mary), and a negative one (through Charlotte), creating an unbalanced system. While on the left side of Figure 1, the entity Mary-Charlotte is confirmed in all other relationships in the system, this cohesion is not present in the 'unbalanced' right part of Figure 1. The contribution of Balance Theory and Symmetry Theory lies in the fact that both Heider and Newcomb have observed strong tendencies towards balanced relationships: when patterns of positive and negative relations are balanced, they are stable, whereas unbalanced systems inevitably create tensions. To achieve a balanced system, these tensions need to be resolved:

relationship systems "strain towards symmetry" [13]. Therefore, an unbalance, or an orientation change in any part of the system can lead to changes in other parts, in order to restore the balance between in the system.

Analyzing the Design Fictions

To apply Newcomb's Symmetry Theory, we draw upon Hodge and Kress's application of the theory [9]. Hodge and Kress apply the theory to newspaper articles, tracing how a newspaper construct a positive or negative relationship with a specific subject. The way a newspaper constructs this relationship has implications. Given the assumption that systems of relationships tend to strain towards a balanced system, relations that might be weakly specified before (for instance, the reader has not formed an opinion on the newspaper editorial office) can be steered into a specific direction. In a situation where there is no pre-existing relationship between a reader and a newspaper, but both the reader and the newspaper have the same positive view on a specific subject in the news, Symmetry Theory predicts that readers will tend to view the newspaper as positive, in order to create a balanced system of relationships (see Figure 2). In other cases, where the relationship between reader and newspaper is firmly established as positive, but the reader has a weakly specified relation to the news topic, the reader will tend to copy the newspaper's orientation towards the topic.

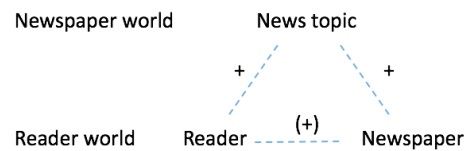


Figure 2. Relationships between newspaper, reader, and news topic (based on Hodge and Kress [9]).

It is possible to construct similar systems of relationships for design fictions. In the paragraphs below, we draw further upon Hodge and Kress's discussion of newspaper media, where they create a distinction between the 'media world' (as constructed by the newspaper), and the 'reader world' (as perceived by the reader) to specify relationships. For design fiction, we propose a distinction between a fictional world, and the real world. Relevant entities in the real world are the reader on the one hand, and currently existing technology on the other. In the fictional world, relevant entities are on the one hand the fictional characters, and on the other the technology as it is portrayed in the design fiction: the 'diegetic prototype' [10], presenting a vision of technological progress and new applications in the fictional world. In the next paragraphs, we show how we used Symmetry Theory to construct the relationships in the design fictions presented in this paper, in order to stimulate reflection on the role of the diegetic prototype.

Evaluating NewSchool

Evaluating NewSchool describes an interview between Mr. Lee, a researcher evaluating the user experience of the NewSchool platform, and Martha, the mother of a boy who has used the NewSchool platform. The story is told by a narrator that takes the perspective of Martha.

In the first half of the story, Martha is presented as a caring mother, who decides to take the interview in the place of her son, Joe. Her son is ill, and Martha does not want to disappoint the researchers investigating the NewSchool platform. Although the researchers were hoping to interview the actual users of the platform (i.e., Joe, as a student), they decide to interview her anyway, as a stakeholder. Martha presents the NewSchool platform as a very useful tool, helping Joe in his schoolwork, and motivating him to increase the effort he invests in school work. As such, the narrative starts out with a balanced relationship system. The readers' sympathy for Martha, a caring mother, is raised. Martha, in turn, has a positive relationship with the NewSchool technology. The intended reading audience, a public of learning analytics experts (like Ferguson et al.'s scenarios; or HCI experts, in this paper) can also be assumed to have a positive relationship with learning analytics and/or technological progress.

However, as the narrative progresses, the initial, balanced relationship system changes. Gradually, it becomes clear that Martha is faking her enthusiasm about the NewSchool platform to obtain a free subscription for her son, as the subscription fees are very high. It turns out that with this hidden agenda, Martha tried to mislead Mr. Lee: she is not as familiar with the platform as she claims to be. Her son has not used the platform sufficiently to gather enough data for a reliable user profile. While Martha keeps up her enthusiasm about the platform, her hidden agenda is uncovered: she tries to avoid the steep subscription prices, as she cannot afford the NewSchool system. This changes Martha's relationship with the platform. Through this change in the relationship system, the readers' perception of Martha's responses about the usefulness of NewSchool are also questioned, and the reader is left to think about the relation between costs (subscription fees) and benefits (the stereotypical feedback about the effects of the platform).

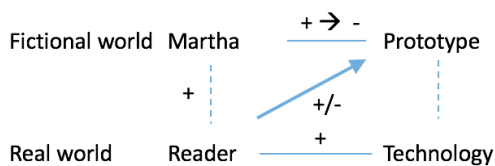


Figure 3. Relationships in *Evaluating NewSchool*.

As shown in Figure 3, the system is not balanced. As relationship systems tend to strain towards a balanced system, the reader needs to review his orientation towards specific elements in the system to restore the balance. Given the unreliability of Martha, the reader is left questioning her positive relationship towards the

technology and the diegetic prototype. Mr. Lee's remarks about the usefulness about such technology further reinforces this. In other words, the unbalance created by the readers' antipathy for Martha, and her feigned enthusiasm for the technology can trigger readers to reflect on their attitude towards the technology and the diegetic prototype.

NewSchoolGate

NewSchoolGate relates the interaction between Nick, a school student, and his mother, who learns about how her son almost got expelled from school for manipulating the school's learning analytics platform. The story is told from Nick's perspective, confessing his activities to his mother.

Nick is presented as a bright teenager with a clear opinion (e.g., "Yeah, that's a load of marketing BS, isn't it."), and a sense of humor ("Clearly, they must think we're all morons. Well, God knows some of the guys at school are, but... Jesus, really.") Although he also has some issues with school (for instance, his declining motivation), he is portrayed as a sympathetic young man – who, admittedly, has gone too far in cheating his school system. Overall, despite his flaws, the narrative attempts to raise sympathy for the character of Nick through Nick's personality and his creativity in cheating the online system. As such, the reader has a positive relationship towards Nick (see Figure 4). While Nick's mother initially disapproves, she also ends up trading her anger for less negative feelings of curiosity.

Constructing the relationship system further, we clearly notice that Nick has a problematic relationship with the diegetic prototype in the story, which he describes as 'for retards' and 'debilitating'. This problematic relationship is the motivation behind his cheating behaviour. However, when presented to a public of learning analytics experts or HCI experts, we can assume that the reader public of the story as a positive relationship with learning analytics and/or technological progress. This positive relationship in the real world creates a potential unbalance in the system (see Figure 4), and can therefore trigger the readers' reflection on the benefits of the envisioned technology.

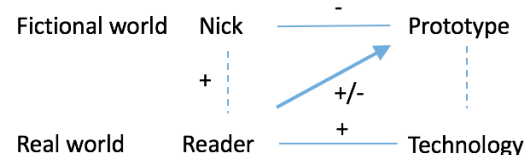


Figure 4. Relationships in *NewSchoolGate*.

Symmetry Theory as an Abstraction

Newcomb's theory is, of course, limited in the sense that it presents an abstraction of relationships that can be more complex than merely 'positive' or 'negative' (a critique also made by Hodge and Kress [9]). A first example of a relationship that is not easily characterized as 'positive' or 'negative' is that between Nick and his mother in design fiction 2. While we did not take up this relationship in Figure 4 since the mother is not the main character in the

narrative, the relationship between Nick and his mother does change. The mother starts out being very angry with her son for almost getting himself expelled from school, while she ends up showing a mix of resignation and understanding for her son. In other words, this relationship evolves from a very negative one to a more neutral one.

A second type of relationship that is difficult to classify is what Hodge and Kress [9] call ‘weakly specified’ relationships. In this case, the relationship between specific participants in the relationship is not specified yet, and can become either positive or negative depending on other relationships in the system. Hodge and Kress offer the example of a reader with no specific relationship towards a newspaper: the reader’s relationship can be formed based on the way a specific news fact is reported in the newspaper (see the section on Analyzing the Design Fictions).

The next paragraphs will use symmetry theory analyses of published design fictions to present further analytic examples. These include analyses of both more intricate, evolving relationships, and weakly specified relationships.

Analyzing Other Design Fiction with Symmetry Theory

Sturdee and colleagues [16] created a design fiction in the form of a graphic short story. In it, the main character is fed up with endless face-to-face dates with men that never seem to lead anywhere. She then decides to try a new technology that facilitates romantic dating using algorithmic match-making. Initially, she has no high expectations (she says “*here goes nothing*” when trying the app), but she decides to try it anyway. She soon finds a man she really likes with the app, starts chatting with him, and decides to meet him in a bar. Implicitly, her faith in the technology grows.

At the start of her date, however, her faith in the technology is breached briefly, as she sees a man in the bar she had already dismissed when browsing through the app’s user profiles (“*No way!*”). The technology seemed to have linked her to a man who is not her type at all. However, soon after, this breach is resolved, as everything turns out to be a misunderstanding. It turns out that there was another man in the same bar waiting for her all along. It soon becomes clear that she *does* have a romantic connection with him: the story has a happy ending.

The main character’s opinion on the technology evolves throughout the narrative: it goes from neutral to negative (the breach described above), but then resolves to positive. On the other hand, the relationship between the reader and the character remains weakly specified: as readers, we see her changing relationship with the technology, but the character itself is not developed further in terms of personality. However, she does show behavior that is recognizable to the reader public: most people have had experiences with dating other people, and have tried new technological apps. The combination of an undeveloped personality with the readers’ possible identification with recognizable behavior (dating, trying out technology) leads

us to qualify the relationship between the reader and the character as neutral, or possibly positive (symbolized by a plus sign between brackets (+) in Figure 5). Due to the main character’s evolving relationship with technology, the entire relationship system in the story also evolves. In the end, this story has a happy end: the tensions in the relationship system are resolved, thanks to the character’s eventual positive relationship with the technology (Figure 5).

Like the NewSchool design fictions, the Sturdee et al. story presents dynamic, changing relationships: In Sturdee et al., the relationship between the main character and the diegetic prototype changes, while in e.g. *Evaluating NewSchool*, the relationship between the reader and the mother changes, when she is revealed as an unreliable narrator. In Figures 3 and 5, these changing relationships are visualized using arrows. Even though Symmetry Theory reduces relationships to either positive or negative ones, incorporating such changes in the analysis accounts for some of the evolution and depth in the narratives.

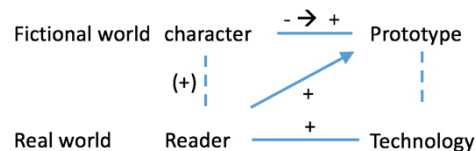


Figure 5. Relationships in Sturdee et al. [16]

As a second example, we analyze a more corporate type of design fiction using Symmetry Theory: Microsoft’s 2011 Productivity Future Vision [14]. This design fiction is constructed with characters silently interacting with different technologies. The interaction is seamless, satisfying the user’s needs, and even proactively offering useful information. The characters’ relation to the technology is positive: it provides all the information they need while working, and at home, and it facilitates remote interaction between a smiling father and daughter, and a travelling mother. As for the relationship between the viewers and the characters, the fiction aims for a maximal identification with the characters, showing different types of people (different sexes and races) in situations that are recognizable to many people (a taxi ride, an office, a home kitchen). However, in this type of design fiction, characters are often bracketed entirely: we do not know anything about them, and the characters become ‘props’ in assistance of the technology. The story moves from use case to use case to demonstrate the usefulness of the technology.

As the design fiction describes the diegetic prototype in a positive way, and if we assume that viewers are positively oriented towards technology, we arrive at a balanced relationship system (see Figure 6). All relationships are positive, except for the relationship between the viewer and the characters, which is weakly specified. However, as in the fiction by Sturdee et al., the combination of undeveloped characters with the viewers’ identification with recognizable situations leads us to qualify the

relationship between the reader and the character as neutral, or possibly positive (symbolized by a plus sign between brackets (+) in Figure 6). As systems tend to strain towards a balanced system, one can assume that the system in Figure 6 will be a balanced system of positive relationships. As a result, the reader's positive orientation towards the technology will be confirmed by the design fiction.

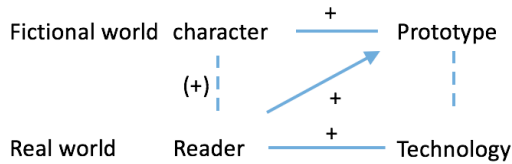


Figure 6. Relationships in Microsoft's Productivity Future Vision.

IMPLICATIONS FOR WRITING DESIGN FICTION

'Affirmative' and 'Critical' Fiction?

The Symmetry Theory analysis of design fiction examples in literature, and of the two design fictions presented in this paper, leads to some implications for the role of specific types of design fiction. The relationships in a fictional narrative form a system of relationships, which can either lead to a balanced, or an unbalanced end result.

We believe an unbalanced relationship system can be most helpful to enable readers to reflect upon the consequences of technological change, and their own orientation towards that change. Inspired by the Dunne and Raby's distinction between 'affirmative design' and 'critical design' [5], we make a distinction between 'affirmative design fiction' and 'critical design fiction' (see also [11]). A balanced system of relationships results in a confirmation of the readers' beliefs: in these stories, the outcome of the fiction confirms the readers' pre-existing orientations: we can call this type of design fiction 'affirmative design fiction', as it reinforces the readers' status quo [5]. On the other hand, an unbalanced system of relationships results in an instable situation, with a strong 'strain towards symmetry' [13]. To achieve this symmetry, readers are led to reconsider, and rethink their orientation towards the fictional characters or the diegetic prototype. Similar to critical design, the fiction leads readers to "challenge narrow assumptions, preconceptions and givens about the role products play in everyday life" ([5], p.94). Such an instable system, leading to reflection can be called 'critical design fiction'.

The analysis of our own design fictions above shows that both stories lead to an unbalanced system for the intended audience. The fictions were written in order to trigger the readers' reflection, and challenge their assumptions about learning technologies. As such, the fictions are intended as 'critical design fiction': the issues raised in the fictions can lead designers to envision alternative designs, moving beyond the status quo. Depending on the authors' intentions, however, we believe that affirmative design fiction can also be valuable: it can reinforce the readers'

position towards technology, inspiring designers by pointing out new technological possibilities.

However, like for critical and affirmative design, the division between affirmative and critical fiction is not absolute. In the same way the boundaries between critical design and affirmative design are fuzzy (see, e.g. [1]), readers can have pre-existing orientations towards technology that were not anticipated. In the Microsoft design fiction, for instance, the character's seamless interaction in an unrealistically clean, modern environment that reflects a single, isolated aesthetic can lead to alienation from the characters and their environment, rather than identification [7]. To arrive at a balanced system of relationships, the viewer will also develop a negative relationship with the diegetic prototypes.

Identification and Alienation in Fictional Worlds

The example in the paragraph above, in which the *environment* of the characters becomes alienating, stresses the importance of identification processes in effective design fiction. If a fictional world is strange and unrealistic, it will impede the readers' identification with the situation and the characters. When used purposefully by the author, such a lack of identification can help in obtaining the author's intentions; when a lack of identification is not intended by the author, this will negatively influence the readers' identification with the characters in the story.

While Symmetry Theory does not explicitly address fictional worlds as such, these worlds are inextricably linked with the characters and objects (e.g., diegetic prototypes) in it. It is the characters in the story that provide readers with 'access' to the fictional world, especially when the story is told from the perspective of one of the characters. In this sense, the familiarity of the environments in the design fictions in this paper stimulate the readers' identification with the characters. Relocating the design fictions to very unfamiliar environments (e.g., outer space, or the strange world on the other side of Lewis Carroll's looking glass) can hamper the reader's identification with the characters. In this sense, the (un)familiarity of the fictional world has a direct impact on the readers' relationship with the characters and diegetic prototypes.

The goal of design fiction is to encourage readers to reflect on their relation with technology that does not yet exist, to form an opinion, or to inspire new design ideas. These goals can become difficult to reach if everything about the fictional world is strange: familiarity with elements in the story, such as the characters' behavior, can stimulate this identification, and therefore the readers' reflection. From the point of view of Symmetry Theory, then, the familiarity with the environment has an impact on relationship between the reader and the characters. A lack of identification can prevent the reader from building an (either positive or negative) relationship with the characters, and therefore prevent the reflection and inspiration that was targeted.

REVISITING THE LEARNING ANALYTICS SCENARIOS

A comparison between the learning analytics scenarios and the design fictions is not straightforward, as the design fictions have extra narrative elements (characters), and the scenarios often lack a clearly defined (diegetic) prototype. However, the shared formal characteristics (e.g., objective narration, uniform structure) described in the Introduction position the scenarios as factual situation sketches, which users can accept as plausible, or not. While the scenarios were part of a process intended “to explore or expose underlying assumptions” [6], their form, in itself, does not stimulate readers to reflect on their assumptions. Rather, it is the process surrounding the scenarios that facilitates it.

In contrast to the learning analytics scenarios, design fiction, through its form, can foster the readers’ reflection in its own right. This reflection can be fostered through a careful balancing of relationships, within the fictional world, and between the fictional world and the reader’s world. By creating an unbalanced relationship system, the fictions presented in this paper aim to stimulate reflection on various aspects of learning analytics, including learning analytics as inclusive technology (fiction 1), its motivational role, and the reliability of user data (fiction 2). As such, the stories can inspire designers to create designs that take into account the messy reality of unmotivated students, platform misuse, and and discontinuous data gathering. This impulse towards reflection makes the stories more independent, while, as Blythe [2]stated, the scenarios are part of a process, and cannot easily be read in isolation.

CONCLUSION

In this paper, we presented two design fictions on learning analytics technology. Based on these fictions, we explored Symmetry Theory as a tool to analyze design fiction as a system of relationships between reader, characters, and diegetic prototype. Besides analysis, the theory proved to be a useful tool in the writing process of the learning analytics fiction. As such, it can also be useful for other writers, helping them in carefully balancing relationships within a story, and between the fictional and the audience’s world.

Symmetry Theory presents an abstraction of actual relationships and content in design fictions: it does not offer an in-depth, fine-grained analysis of the content of design fictions. However, it does offer a schematic overview of the potential relationships between the reader and the content of the story. In this way, Symmetry Theory offers researchers, designers, and other design fiction writers a tool to think about design fiction, and its effect on the reader audience.

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