A Look at the Role of Design in Education: Developments, Trends, and Practical Use

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Abstract

Research in game design has analyzed the role of design in games such as the design of conflict, engagement, and systems. Additionally, research in education has identified learning principles inherent in good games such as actionable feedback, low cost of failure, and integrated learning and assessment. However, one of the conclusions of this research questions why these principles are not more widely utilized beyond games. Design has been relevant in the field of education for over a century, but there seems to be a gap in the historical and practical context. This study investigates the development of design in the field of education (from instruction design to learning design), highlights current research (cybernetics, games and education), and offers practical ways to apply design ideas in education.

Background

I became interested in the connection between games and language learning during my master's degree. I was interested in how tasks could be inherently self-assessed by design. I found it fascinating that if a task was well designed, assessment could be built in. It occurred to me that games are similar. You never have to check whether you finished a game or not. As Gee (2013) put it, "No one needs a *Halo* test after finishing Halo…" (p. 12). To help me pursue this idea further, I was referred to James Paul Gee (quoted above). I wrote about the learning principles he defined in good games and their relation to Second Language Acquisition and Task-Based Language Teaching (TBLT) (Vegel, 2019). Having now engaged more in the literature of game design, I started to wonder why design ideas seem to feedforward into education rather than feedback. After all, teachers have lots of practice designing and revising lessons (among many

other considerations like designing materials and textbooks). I began to wonder what role design has taken in the education field if at all.

Design

Design, in common language, is not only referred to in terms of *design fields* like graphic design, product design, or fashion design but also in terms of its *negative associations* like pretentious, high-minded, or overpriced products like controversial architecture, ambiguous visual design movements, or designer goods. That design seems to lend more to excessiveness than practicality can be seen as a result of these popular conceptions. These negative associations are well illustrated in design that lacks a focus on function – "design for design's sake." Take the 431 m, 18º slope of the Solomon R. Guggenheim Museum designed by Frank Lloyd Wright. The design of an art gallery, functionally a place to view art, became a place that functionally changed the way art is viewed – Frank Lloyd Wright's intention. Negative associations may also come from conflating the nature of aesthetics and design. While *aesthetics* according to Hegel (2004) is concerned with the philosophical questions of art and fine art, *design* is concerned with concrete problems: the desired outcome vs. the actual outcome.

System

Salen and Zimmerman (2004), in their book *Rules of Play: Game Design Fundamentals*, consider "games as designed systems" (p. 2). In a robust approach to game design analysis, they set out to establish precise discourse on the subject. Emphasizing the nature of application beyond game design, they define a *designer* as someone "involved in the creation of systems of interaction" and *design* as "the process by which a designer creates a context to be encountered by a participant from which meaning emerges" (p. 41). Thinking in design terms means considering how the system created will be interacted with and what will emerge from that interaction. Considering *system* within the definition of *design* extends our usual conception of design to include *interaction* among the questions of design problems.

Systems can be found in design even if the visual aesthetics first elude us. Design books such as *Good Design 1993-1994* review standout product design and highlight the striking visual aesthetics of each entry. Take the QR-10 Digital Sequencer released by Yamaha in 1993 (Japan Institute of Design Promotion, 1994, p. 49). Its shape (a top-down silhouette of a grand piano), colors (purple, grey, orange, yellow, and red), and button layout (a small octave keyboard, a

diamond of 12 chord types, and performance sections) make it clear *visually* that it is a music machine. However, the button layout and quick-access features outline a proposed *system*: The left-hand plays chords, and the right-hand solos. Quick functions are also accessible for sequencing and accompaniment (record, start/stop). The QR-10 is a unique music making machine not because it looks like a grand piano or even because it can emulate acoustic instruments. It is unique because of the design as a whole (the visual elements as well as the designed system). The possible outcomes from interacting within the system are far greater than the sum of its parts. Chomsky (1957)'s famous sentence "Colorless green ideas sleep furiously" illustrates this idea in terms of language. From limited rules, unpredictable outcomes emerge.

We can explore the role of systems in language education as well. Learning language requires acquiring both declarative and procedural knowledge. Building language skills requires interaction linked to a communicative purpose. Teachers can attempt to organize interaction and feedback by carefully designing a lesson, but the outcome depends on a range of unpredictable factors. As many teachers have experienced, when repeating the same lesson more than once, rarely do the same teachable moments emerge or are the same outcomes reached. Textbooks (and learning materials in general) offer unique examples of these design considerations as well. A *complex system* like an information gap might lead to a greater range of emergence due to its open nature and reliance on interaction. A *fixed system* like a gap-fill offers less opportunity for emergence due to its closed nature but still holds some potential for unpredictability i.e., when vocabulary choices are ambiguous. How this unpredictability is handled in the design process is essentially considering *second-order design problems*.

Salen and Zimmerman (2004) consider these design questions in terms of games, but practical considerations extend beyond. Design, whether it be a commercial music product like the QR-10 or learning materials like a textbook, needs to consider not only the parts of the system but also the potential outcome of interacting with those parts. We can design the system *directly* but experience only *indirectly*. Outcomes emerge greater than the sum of the parts of the system. With the range of our conception of design clarified, we can reflect on how design has been considered in the field of education.

Design and Education

Instructional Design

Although design has been used in the field of *language education*, there is a more general use of the word in the field of *education*. This history is covered by the historical reviews of Reiser (2001a, 2001b), An (2021), and Kang (2004). The history of instructional media and design (ID) spans over a century. Although the timeline is marked with developments in educational psychology, it is also marked by edu-tech trends and commercial investments (An, 2021; Kang, 2004). While the history of *instructional media* focuses on the use of technology for educational purposes, *instructional design* focuses on the problems of learning and performance related to instructional principles. However, Reiser (2001b) observed that "there is an obvious overlap between these two areas" (p. 64) as both have developed in parallel and in reaction to each other. Therefore, although the term *media* is used to refer to actual technology, *design* implications are inherent.

According to Reiser (2001a), ID began in the 1900s with school museums – functionally centers of *visual instruction* that utilized slide projectors. From 1908-1910 the Keystone View Company published *Visual Education*, a guide to visual media use in the classroom, and Rochester, NY adopted films for instructional use as a first in the U.S. In 1913 Thomas Edison declared textbooks would be obsolete due to the emergence of motion picture technology. From 1920-1930 radiobroadcasting and sound ushered in the *audiovisual instruction* movement. However, both *visual instruction* and *audiovisual instruction* movements failed to facilitate substantial changes in education, and commercial interests lost over $50 million. In the 1940s during World War II, military services and industry made use of audiovisual instruction. The U.S. Air Force produced 400 training films and 600 filmstrips from 1943-1945 with approximately 4 million showings. However, again, educational practices in schools were not greatly affected. In the 1950s, television channels with instructional programming started. This technological trend was accompanied by the *programmed instruction* movement. In the 1960s the Ford Foundation invested $170 million in educational closed-circuit television. Case studies among all grade levels in Washington, Maryland, a junior college in Chicago, Illinois, and a series of college courses at Pennsylvania State University utilized closed-circuit television as a medium of instruction. By 1963 the Ford Foundation had divested from educational closed-

circuit television to focus on public television exclusively. In the 1970s terms *educational technology* and *instructional technology* took hold along with over 40 different models for designing instruction. By the 1980s instruction design had still had little impact in public schools or higher education. Instructional improvement centers that were made from 1970-1980 were largely disbanded and on a downward trend. By 1983 computers were used for educational purposes in nearly 50% of elementary schools and over 75% of secondary schools in the U.S. In the 1990s computers were mostly used as an extension of traditional methods like drill and practice or teaching computer related skills like typing. From 1995 to 1998 higher education institutions utilizing asynchronous distance learning classes rose from 22% to 60%, and internet access in schools rose from 50% to 90% within the same period. However, yet again, these increased affordances garnered little uptake resulting in little actual use. Reiser (2001a) concluded that

> you are likely to note a recurrent pattern of expectations and out-comes. As new medium enters the educational scene, there is a great deal of initial interest … However, enthusiasm and interest eventually fade, and an examination reveals that the medium has had a minimal impact… (p. 61).

An (2001) similarly concluded that the history of ID "shows a recurrent pattern of enthusiasm and little effects on actual practice" (p. 13).

What is apparent in the history of ID is the overall whiplash pace of new trends, large investments, and quick divestments. This may be what Dewey warned about in 1915, with the claim that new movements in education can be seen as "at the worst transitory fads, and at the best merely improvements in certain details" (p. 4). Dewey further questioned waste in education blaming "the lack of unity in the aims of education, [and] the lack of coherence in its studies and methods" (p. 60). Dewey's century old reflections still reign true today.

Notably, however, despite the ebbs and flows of ID, some design ideas seem to have proliferated quietly throughout the last century especially in regard to systems. Although running parallel to emerging technology and commercial investments of the time, the idea of systems in education progressed with concepts like general systems theory and instructional systems design (Kang, 2004). Starting from the 1960s programmed instruction ran parallel to the investments and experimental take up of closed-circuit instruction, and a range of ideas were introduced

along with the concepts educational technology and instructional technology: system development, systematic instruction, and instructional system (Reiser, 2001b).

Cybernetics

Among these systems ideas, research in the education field has looked to cybernetics to help explain control systems and reflection in the learning process such as formative assessment, positive feedback, and procedural knowledge. Cybernetics was first introduced in *Cybernetics or the science of control and communication in the animal and the machin*e – first published in 1948 (Wiener, 1961). Cybernetics is concerned with problems of complexity and control in systems and "deviation from a stable state" in which negative feedback promotes stability and positive feedback undermines stability (Salen & Zimmerman, 2004, p. 350). A simple example of a cybernetic system (and feedback loops) is a temperature control system such as an air conditioner or heater (Wiener, 1961). This system includes an environment, a sensor, a comparator, and an activator. The *sensor*, in this case a thermometer, samples the environment and informs the *comparator*, the set temperature, which then decides how the *activator*, the cold or hot air system, should act. In the case of temperature control, a negative feedback loop works best because it is designed to return environment to the target temperature while a positive feedback loop is designed to move away from the target.

Admittedly, these ideas applied to education seem off-putting. For example, the automaticity of education comes to mind – a point Wiener (1961) ardently warned against. Ashby (1957) although similarly specifying cybernetics as focused on questions of co-ordination, regulation, and control, also proposed that *these questions* provide a "common language" with which to approach problems related to systems. The potential of cybernetics lies beyond machines and automaticity and among this common language.

Studies in the field of language education have emerged utilizing cybernetic concepts in terms of understanding formative assessment as a means of controlling a loss of meaning (Roos & Hamilton, 2005), the role of circularity in teaching and learning (Murray, 2006), positive feedback loops as a cognitive mechanism (Reigel, 2005), feedback in complex learning environments (Westera, 2013), second-order implications of skill acquisition (Scott & Bansal, 2014), and frameworks for e-learning management (Hilgarth, 2011). From this small sample, specific themes emerge:

1. A focus on feedback loops and stability
2. Second-order cybernetics: the ability of a sensor (or observer) to monitor itself

The first point borrows simple ideas like feedback loops in a temperature control system and uses this “common language” expand on language learning concepts. The second point explains the problem of self-monitoring in the skill acquisition process. Although we can easily reflect on knowledge stored as declarative knowledge (expressed explicitly), we have far more difficulty reflecting on the knowledge of skills and procedures (expressed procedurally). Although cybernetics may initially seem ridged and antithetical to the questions of education, its concepts offer unique perspectives on issues related to language learning.

Learning Design

ID grew out of the movements of behaviorist psychology and systems engineering based on developmental models used by the U.S. military in WWII. However, the term learning design (LD) has also entered the lexicon. “Reclaiming Instructional Design” (Merrill et al., 1966) gleams some light into the internal struggle within the ID field and a move towards a new approach. The authors claim that the field of ID has been too easily swayed by the whims of silver bullet ideas, and that “[education] and its related disciplines continue to flutter this way and that by every philosophical wind that blows" (p. 1). The authors lament the (then current) state of ID, and proposed signpost like directives that include understanding the learning experience, environments that support it, and utilizing verified learning strategies. They called for a more science-based paradigm by offering an anecdote from aviation. The discovery of principles such as lift, drag, and flight (the science) preceded the invention of an airplane capable of sustaining powered flight (the technology). Although instructional design is informed by principles of behaviorism (and then refined by cognitivism), lots of what has steered the field appears to come from emerging commercial technology not fundamental principles agreed upon within the field. This is well illustrated in the historical record of ID (An, 2021; Kang, 2004; Reiser, 2001a, 2001b).

Another article titled “Beyond Instructional Design: Making Learning Design a Reality” (Sims, 2006) seems to further summarize the movement away from ID simply enough, but reality appears more nuanced. Although LD, according to Donald et al. (2009), “documents and describes a learning activity in such a way that other teachers can understand it and use it in their own context” (p. 180), the overall theme of LD has been focused on e-learning and online

learning. Koper and Tattersall (2005) further frame this movement as a reaction to current e-learning tools' lack of pedagogical quality. Even the epistemological underpinnings of ID and LD (the conceptual understanding of knowledge) have been questioned as whether education is a "transfer of knowledge" (ID) or a "complex process between teachers, learners, and the context domain" (LD) (Sims, 2006, p. 1). Beyond this fuzzy discourse, the main focus of LD has been the Learning Design Frameworks that have grown out of a simple, concrete design problem: how to describe pedagogical styles within a pedagogical meta-model (Koper & Tattersall, 2005).

This meta-model in its current form describes the roles, activities, learning environment, and methods like the notation of a stage play. These descriptive elements have also been referred to as "educational notation" and compared to musical notation (Dalziel et al., 2016). Through this notation-like approach, a "toolkit" around the concept of learning activity has emerged to define *task* (type, technique, interaction, roles, resources, tools, assessment, sequence), *context* (aims, learning outcomes, pre-requisites, skills, subject, environment, time, difficulty), and *learning and teaching approaches* (associative, cognitive, situative) (Conole & Fill, 2005).

In practice utilizing LD requires coding in a learning specification language like the now Instructional Management System (IMS) adopted Educational Modelling Language (EML) and then running the encoded file in a player (Westera et al., 2005). These innovative ideas both conceptually and practically seem key to summarize, record, and distribute lessons in a robust and accurate way. As Dalziel et al. (2016) summarize "[LD's] ultimate goal … is not just representation for representation's sake, it is to help educators to describe, share and adapt effective teaching and learning activities – that is, designing for learning" (p. 22). However, the goals of making design explicit and easily reflected upon by designers and others while also allowing for refinement and sharing, Koper and Tattersall (2005) admitted, is "still a future perspective" (p. 3). Cameron (2017) helps cement this fact by showing that recent policy has already started to reference LD, yet little of what LD offers seems to be readily applied in praxis – in this case, a sample of 6 Australian universities.

There should be a further note of caution in regard to LD and the role of IMS Global Learning Consortium in LD development especially in light of the tumultuous timeline of ID. IMS is a non-profit organization (IMS Global, 2003). This, however, is not always a good indicator of incentives or intentions as Au and Ferrare (2014) illustrated in their case study of charter school reform in Washington state. IMS maintains non-profit status, but of the 18 board

of directors, 7 hold positions at for-profit institutions. Additionally, some Contributing Members, members who have voting privileges, are not only for-profit institutions but private for-profit universities or holdings companies for such universities. Private for-profit universities frequently make headlines for federal investigations, scams, false promises, and pay outs to students ordered by federal agencies. American Military University (AMU), an online-learning university system of private for-profit universities under the American Public University System (APUS), was ordered to pay $270,000 by the Attorney General who found AMU in violation of Massachusetts law (Office of Attorney General Maura Healey, 2018). University of Phoenix (UoPX), a private for-profit university, was ordered by the FTC to pay $50 million in refund checks and $141 million in canceled balances (Federal Trade Commission, 2021a). Additionally, UoPX and APUS, are both named in an FTC Notice of Penalty Offenses list, which although not directly incriminating, does include possible offenders put "on notice." This list also named IMS Global Affiliate Members, non-voting members, Full Sail University and Walden University (Federal Trade Commission, 2021b).

LD, despite its innovative and unique approach to education's problems, does not seem to stray far from ID in terms of trajectory. LD even drags edu-tech to the precipice of new trends like data collection and digital rights management in a market fraught with profit driven motives. ID and LD both have a trove of innovative ideas, but both have failed to apply substantively design ideas in the classroom.

Methods

Despite the use of the word *design* in the education field for over a century, fundamental design questions seem to have been overlooked. This point is reiterated as James Paul Gee has long shown: Design in good games utilize learning principles not often found in classrooms. Gee (2013) made these ideas more concise by suggesting that good learning is "situated embodied problem-focused well-designed and well-mentored learning" (p. 12). Some approaches to language education have developed along similar lines – TBLT notably (Vegel, 2019). However, many methods seem to have developed largely by reactionary turns. Like the long historical significance of ID, methods have played an integral role in the language education field and are well situated in teacher training. It is thus important to understand where design starts, method ends, and how these ideas function together if at all.

To approach an understanding of method, it first needs to be situated among the milieu of similar terminology. Anthony (1963) offered hierarchal categories to differentiate approach, method, and technique. *Approach* refers to the underlying principles guiding teaching and learning (behavioral science, cognitive science, psycholinguistics, sociocultural theory). *Method* refers to the plan to carry out language teaching and learning (the set of procedures or processes). *Technique* refers to the actual elements of implementation (the activities or exercises).

Design, however, is more elusive. Although the term is used in education (instructional design, learning design, material design), a clear, narrow definition is lacking and even usage in language education reference books lends more its general meaning in terms of ID or LD. Richards and Rodgers (1986) offered some insight into the use of design in language education as they explored the gap between *approach* (values) and *method* (plan/procedure) suggesting the need to develop an "instructional system." For them, considering design meant considering objectives, syllabus, learning tasks, learners, teachers, and instructional materials. Great lengths were taken to explain these six elements, but little attention was given to the concept of system. Even their critique of Anthony (1963)'s description of approach, method, and technique with their own take, "method as approach, design, and procedure" (Richards & Rodgers, 1986, p. 28), did little to help the ambiguity. Design, defined by Richards and Rodgers (1986), was not considered a value (approach) in and of itself; it was primarily considered a tool of analysis to bridge the gap between approach and method, and further left an ill-defined "instructional system." Even though design should be concerned with the problems of interaction and emergence, it appears again that little attention has been given to defining it in those terms.

However, other clues about the role of design in language education can be found by looking further into the past. For centuries even though design was not likely a serious concern in education, it seemed to be on the tip of the tongue of educators and theorists. Celce-Murcia (2013) surveyed language teaching methods from pre-20th to the 21st century. One notable case comes from the 19th Century, when von Humboldt, a German philosopher-scientist, argued that "A language cannot be taught. One can only create conditions for learning to take place" (p. 2). von Humboldt's use of "create" and "conditions" suggests an understanding of designed learning opportunities – a nod to second-order design problems.

Celce-Murcia (2013) further examined methods by observing that methodological trends have long been reactionary emphasizing that these trends are easily misunderstood without a

clear historical perspective. Three reasons are proposed to explain the state of methods in language education:

1. Methods are easily sellable and thus profitable.
2. Methods do hold a place in education but only in ideal conditions.
3. Much of the field has been bouncing between a use-analysis dichotomy.

Celce-Murcia (2013)'s first point is a call to skepticism. A movement to post-methods explains this well. Dale's Cone or *Dale's Cone of Experience* also well illustrates similarly how damaging inflated silver bullet ideas can be. Disambiguating the complex web of misinformation related to Dale's Cone has unfortunately become an important area of study. Dale's Cone is a pyramid shaped chart introduced by Dale (1946). It presented 11 learning experiences afforded to learners of the time (e.g., motion pictures, educational television, exhibits). Dale (1970) clarified the cone as "only a model," "a visual analogy," and one that "does not bear an exact and detailed relationship to the complex elements it represents" (p. 98). Despite this clarification, the cone was misread and erroneously *conflated* with ideas of retention and learning efficacy – ideas that were ostensibly generalized support of popular ID trends (Subramony et al., 2014a). Unsubstantiated percentages were applied to each learning experience (Letrud & Hernes, 2018). The cone was then *corrupted* with the creation and publication of different versions and adaptations of the conflated cone, again unsubstantiated (Dwyer, 2010; Subramony, et al., 2014a). Since the 1970s investigative and analytical work has focused on illuminating the dubious and falsified nature of the conflated and corrupted cones. However, these cones continue to disseminate at large (Subramony et al., 2014b). These cones can be found referenced uncritically on public university websites and in recent peer-reviewed academic publications referencing Edgar Dale despite the now well-established historical record. This is an alarming fact that echoes a need for skepticism and illuminates a surprising lack of due diligence in the field of education.

Celce-Murica (2013)'s second and third points consider the ideal conditions necessary to implement methods and the use-analysis dichotomy that seems to have guided reactionary trends. Kumaravadivelu (2006) touched on these two issues by looking at past methods and towards post-methods. Most prominent in the timeline of methods to post-methods is the turn to a Communicative Language Teaching (CLT) in reaction to the Audiolingual method. Despite

CLT's promise to be a "principled response" to traditional approaches, Kumaravadivelu (2006) summarized a range of critiques that questioned its authenticity, acceptability, and adaptability as a viable method. These critiques emphasized CLT's inability to guarantee authentic communication, its lack of divergence from past methods, and its inability to be widely adapted across teaching contexts respectively.

Kumaravadivelu (2006) summarized the post-method movement as "not an alternative method but an alternative to method" (p. 67). Post-methods grew from a perceived need to understand the lack of neutrality of methods (Pennycook, 1989) as well as reject the infatuation with finding the best method (Prabhu, 1990). Work towards a post-methods approach has thus led to alternative frameworks. One convincing contribution is the production of three operating principles of pedagogy: particularity, practicality, and possibility (Kumaravadivelu, 2001). *Particularity* considers the context and location. *Practicality* considers the theory to practice loop. *Possibility* considers the role of identity formation. Unsurprisingly, these ideas bode well with Gee (2013)'s refined principles of good learning: "situated embodied problem-focused well-designed and well-mentored learning" (p. 12):

- Meeting the needs of *particularity* requires education that is *well-mentored*.
- Meeting the needs of *practicality* requires education that is *well-designed*.
- Meeting the needs of *possibility* requires education that is *situated and embodied and problem-focused*.

Although this is a simple and generalizable synthesis, it is important to note the divergence in how these ideas were attained, consider why there is cohesion, and frame practical considerations. Kumaravadivelu (2001) approached these ideas "in the search of an alternative organizing principle" (p. 557) while Gee (2013) approached these ideas by identifying learning principles inherent in good games. In other words, despite one approach developing through the considerations of a problematic framework in language learning and the other through the analysis of how good games are designed, both come to similar conclusions about good education.

This convergence of ideas highlights the popularity of TBLT in post-methods literature. TBLT is a method blurring approach that embraces situated and problem-focused learning. Although the lack of clear definition of task has been noted (Willis & Willis, 2007), a basic if not

robust concept of task has been accomplished (Ellis, 2009; Nunan, 2004), one that falls well in line with learning principles utilized in good games (Vegel, 2019). The general concept of TBLT embraces the idea of situated learning as a value (approach). Even a basic definition of task emphasizes co-construction, negotiation of form and function relationships, and accomplishing locally determined goals (Ellis, 2009). However, designing this kind of learning opportunity requires an understanding of emergence more so than a traditional classroom lesson would.

Kumaravadivelu (2001)'s words reign true here: "Admirable intentions need to be translated into attainable goals, which, in turn, need to be supported by actionable plans" (p. 76). TBLT remains flexible because it does not manifest a single method, but this is a double edge sword that keeps TBLT somewhat esoteric. Looking at a way forward, following past trends of reductionism and more minutely defined definitions and relying on edu-tech trends to create substantive change in education seems unreasonable; moving forward with ideas that synthesize well from post-methods and learning principles found in good games, especially those with attainable goals and actionable plans, does seem reasonable.

Beyond the Winds of Change: **Emerging from Under the Carpet**

Strategic Interaction

The work done with Strategic Interaction (SI) seems to provide potential in terms of attainable goals and actional plans as well as practical design ideas. SI was introduced by Di Pietro (1987) through a rejection of language as a "script-based, disembodied, information-transfer process" (Danesi, 1993, p. 481). The basis for this approach is situated in the 18th century philosophy of Giambattista Vico. This philosophy established the importance of *rhetoric* and rejected the "old spectator epistemology that resulted in 'receptor' classrooms" (Perkinson, 1976, p. 756). *Dialogue* is established as a significant part of Vico's philosophy because of the concept of *modification*, only through which one can refine, change, and continually improve. SI thus grew out of the idea that learning needs to involve doing and reflecting. Danesi (1993) described an SI approach as:

> The use of the student's innate tendency literally 'to imagine' what to do in a given situation implies allowing learners to come up with the crucial concepts involved in typical social scenarios so that they can be reformulated – or reconceptualized – in terms of the target language. (p. 484)

Danesi (1993) noted the importance of situations and scenarios for discursive engagement. Building a scenario requires asking question like "*who* says *what* to *whom*; *where* and *when* it is said; and *how* and *why* it is said" (p. 483). Answering these questions helps create setting, message content, participant roles, and goals. Scenarios in SI are supported by role cards used throughout 4 stages. Role cards include a title, roles, topics, and notions/functions (speech acts) as well as robust role descriptions that clarify each interlocutors' goals for the scenario.

SI puts scenarios and roles to use in stages:

- *Pre-class Preparation*: The teacher selects or creates appropriate scenarios and prepares role cards to describe them.
- *Phase 1 (Rehearsal)*: The students form groups and prepare agendas to fulfill the roles assigned to them. The teacher acts as advisor and guide to student groups as needed.
- *Phase 2 (Performance)*: The students perform their roles with the support of their respective groups while the teacher and the remainder of the class look on.
- *Phase 3 (Debriefing)*: The teacher leads the entire class in a discussion of the student's performance. (p. 487)

The rehearsal stage is for learners to imagine and work through how the scenario can be performed. After preparation and deliberation, the performance phase stresses fluency and the use of already acquired knowledge and skills. After the performance phase, learners reanalyze the scenario and performance as a form of debriefing (Danesi, 1993). This phase considers Vico's concept of modification; learners reflect on and modify their performance.

Weber State University published 150 scenarios with an SI approach following the same scenario/role style mentioned above. One example is adapted:

- Roles: parent/child
- Topics: travel, weather, clothing
- Notations/Functions (speech acts): expressing needs, convincing
- Role A: You need to pack for a trip to France. You want your parents' help, but you also know they usually packs too much, which you want to avoid to leave room for souvenirs.

- Role B: You just got information about the weather report in France. It will be an unreasonably cold season you want to convince your child to bring enough warm clothes. (Weber State University, n.d.)

Limitations are an important part of what makes role cards work. First, there is the limitation of role. Without clear descriptions, roles would be non-functional. The descriptions introduce conflict that needs to be resolved while also limiting the scope of the scenario. Another important part of scenario is the focused speech acts that, although limiting how the conflict is approached and handled, creates a way to simulate a real-world situation. Limitations can be seen in other adapted examples as well (notice the conflict inherent in each):

- Scenario: Students on the wrong bus vs. A bus driver who needs to stick to his schedule
  Speech acts: Explaining, apologizing, asking, refusing, submitting
- Scenario: Friends planning a visit to the zoo vs. One friend wants to see a movie
  Speech acts: Convincing, describing (Weber State University, n.d.)

SI provides not only potential for practical in-class use in the form of actional plans (scenario/role) but also attainable goals (via reasonable means) in terms of the rehearsal, performance, and debriefing phases. Danesi (1993) appropriately appraised SI as allowing "the contents to *emerge* from the learner" (p. 489). By playing within the parts of the system different kinds of solutions can emerge.

Extending the Definition of System

So far, we have framed design in terms of system and second-order design problems: what emerges when we interact with the parts of a system. However, we have not yet expanded the concept of system to include the role of limitations clearly. In terms of language education, learners are tasked with not just learning the forms of language but also the functions and more specifically how both are situated in real-world scenarios. Practicing real-world scenarios within a system of limitations is thus a simulation.

According to Salen and Zimmerman (2004), "a simulation arises from the operation of a system in which every element contributes in an integrated way to the larger representation" (p. 439). This definition establishes simulations as a complex system – one that is representational. Representational proceduralism requires limitations for two reasons:

1. Simulations are abstractions in that "a simulation does not attempt to simulate every aspect of its referent, but instead only focuses on those elements necessary" (p. 439)
2. Simulations are purposefully limited as "even a supposedly 'realistic' simulation only depicts a tiny slice of any real world or imagined phenomenon" (p. 440)

Again, this discussion is in terms of game design, but the analysis is salient in terms of understanding education as a "purposeful learning process" (Egenfeldt-Nielsen, 2004, p. 17). SI is a convincing approach because it involves simulations of real-life scenarios. There are meaningful choices to be made because of (not in spite of) the limitations. The alternative, no limitations, would result in learners struggling with available options and stumbling to proceed. In terms of design, simulations are designed systems of interaction and abstraction that are inherently aligned with the goals of language education.

Games and Education

Games, as Salen and Zimmerman (2004) define them, are "system[s] in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" (p. 80) which situates them in the considerations of design. The use of games for educational purposes is not a particularly new phenomenon starting with military strategy games like *Chaturanga*, an ancestor of chess, and *Kriegsspiel,* a map-based board game – both popularized in the 18th and 19th centuries respectively (Egenfeldt-Nielsen, 2005). The use of electronic, commercial games in education began in the 1970s with the Learning Company producing games like *Oregon Trail* and *Lemonade Stand.* However, the development of these kinds of games peaked in the 1990s (Egenfeldt-Nielsen, 2005). If you were in primary school in the 1990s like me, you may recall playing the Learning Company developed Super Solvers games like *Treasure Mountain* and *Treasure Cove*. However, the fate of commercial education games unfortunately parallels the history of ID – initial investment followed by near abandonment. The decade between 1990-2000 saw education game related revenue drop nearly 50% (Egenfeldt-Nielsen, 2005). Despite this dramatic divestment, the research field of games and education saw a marked increase from 2001-2010 (Hwang & Wu, 2012) and a relatively stable increase between 2014-2019 (Benini & Thomas, 2021).

Egenfeldt-Nielsen (2005) completed a detailed review of the field of games and education. This is a broad field distributed across disciplines. This multidisciplinary nature has resulted in the proliferation of many unique ideas. The challenge now is achieving consensus. The terms digital game-based learning (DGBL), game-based learning (GBL), game-based language teaching (GBLT), and edutainment are all used to describe the various facets of the field. Furthermore, a large focus of game-based research is bifurcated between:

1. The *use* of games for education purposes (both electronic and analog games).
2. Exploring the design elements and learning principles inherent in good games as pedagogical *inspiration.*

The *use* side of the field has focused on games' learning potential whether they be digital or analog and applying that potential in praxis. Here games are considered valuable because of the motivational affect and the situated, active learning opportunities they offer learners. In terms of language education specifically, games offer a way for learners to encounter novel language, cooperate towards shared goals, and use context specific language. This is seen in the use of massive multiplayer online role-playing games (MMORPG) to promote interaction (Peterson, 2012; Bytheway, 2015), games that include repetitive game elements and particular vocabulary like a baseball game (deHann, 2005) or music game (deHann, Reed, & Kuwada, 2010), the use of role-playing board games to promote interaction and reflection (York, 2020), or the use of various games to promote language and literacy both with and around games (deHann, 2019; York, Poole, & deHann, 2021). Although Benini and Thomas (2021) identified a number of empirical studies in the field of game-based learning research, they find the research still limited and lacking rigorous methodology. deHann (2021) critiqued the current state of the field in similar terms highlighting the lack of practical implementation and praxis focus calling for a "pedagogy-first approach with games" (p. 270).

The *inspiration* side has looked at the design elements and learning principles inherent in good games. This has been the focus of Gee (2003, 2004, 2013). Gee (2013) explains that "good video games have design features that are particularly relevant to language learning" (p. 19). By playing "good" games like *Sim City*, *Civilization*, *Deus Ex*, *Half-Life*, and *Metal Gear Solid*, Gee (2003) identified 36 learning principles found in games (a small sample of which follows):

- Psychosocial Moratorium Principle: a low-risk practice space

- Concentrated Sample Principle: tasks concentrated in early stages
- Bottom-up Basic Skills Principle: basic skills learned in context
- Practice Principle: lots of practice
- Active, Critical Learning Principle: active, critical
- Committed Learning Principle: time, engagement, commitment
- Incremental Principle: builds towards more complexity
- Probing Principle: form a hypothesis and test it

The first level of "Super Mario Bros." (released by Nintendo in 1983) is a good case study to explore how these principles support the acquisition of skills and skill utilities in-game and further why such an analysis has been seen as worthwhile in general.

In 1-1, the introductory quasi-tutorial first level of "Super Mario Bros.," the player is presented with a *low-risk practice space*. If the player fails, they lose very little progress. This initial area acts as *a small sample* of skills and skill utilities needed to progress (Skill: jump; Jump utility: avoid enemy, eliminate enemy, pass barriers, traverse gap, direct shell). These skills are acquired *bottom-up*. Although this first level is ostensibly a tutorial, nothing is explained explicitly in-game; instead, players are afforded *lots of practice*. The player must *actively learn and critically test* skills and skill utilities if to progress past even the first 10% of the level. Progressing through the level, skills become more challenging to utilize as the level builds in *incremental complexity* (gaps: wider, barriers: higher, enemies: more concentrated and complex). The player is given plenty of *time to commit and engage* in the environment (400 s/6.6 min) through which they can *form and test hypotheses* (e.g., If I can jump, can the "question block" be hit and utilized? If I can jump and move up (an early skill), can I crouch and move down a tube (a later skill)?). A rough analysis identifies at least eight learning principles (17 instances), three skills, and six skill utilities. This deconstruction does not propose that *Super Mario Bros.* is a replacement for good teaching or even that utilizing the game in a classroom would be pedagogically sound. This deconstruction simply shows why the *inspiration* side of the field has found game design so convincing. Game design takes active and situated learning seriously.

Similar to deHann (2021)'s critiques, Egenfeldt-Nielsen (2005) sums up both sides of the field and suggests a way forward:

> … games should challenge educational practices while seeking the realization of realistic educational scenarios. This balance is delicate, but also critical if computer games are to have a real impact and justification in educational efforts. Without the challenge of current practice … games risk becoming of little interest to anyone; trapped in the caricature of edutainment, pointing educators back in time instead of forward (p. 11)

Egenfeldt-Nielsen (2005) is particularly concerned with the balance between the two broad areas of focus (use and inspiration). Although work has been done to identify the learning potential in games and the reasons some games are well designed learning systems, the actual use of games in education aside from experimental studies remains anemic. A need for more wide scale acceptance and interest is apparent in this still emerging field.

Games, Play, and Fun

Above we looked at the field of games in education. Games were defined as systems, and like SI, simulations that rely on limitations. Regardless of whether your interest in games (in terms of education) resides in the *use* or *inspiration* side of the field (or naturally somewhere in between), an understanding of how *play* and *fun* are related to systems, simulations, and games is required. In simple terms, why bother interacting with the parts of a system or simulation?

Although Salen and Zimmerman (2004) do not define games in terms of, fun is fundamental to games, and in fact, fun and play are inextricably connected. When we decide to play a game (or interact with a system or within a simulation), we enter a *magic circle* where we accept the rules and limitations taking on what is called a *lusory attitude*. We can then play within the limitations as the game was designed. Bogost (2016) in the book *Play Anything* offers a unique understanding of these concepts:

> We experience games by 'playing' them, and play is an activity we tend to associate with freedom, with being able to do whatever we want. This view of play stems from conditioning ourselves to see play as the opposite of work … [However,] … games and play offer the opposite: an invitation to do only what the system allows, for no reason other than the fact that it was designed that way. Games are built out of constraints, and play arises from limitations (p. 138).

For Bogost (2016) *play* is not freedom but rather acting within playgrounds of limitations, and *fun* is not an escape from reality but rather "manipulating a familiar situation in a new way" (p.

79). In short, utilizing games in education is not a shortcut or a cheat; it is a deliberative design choice that involves organizing learning opportunities through designed conflict and interaction, by setting limitations, and approaching problems in novel ways.

Practical Considerations

Although design in education has been, in simple terms, imprecise, I hope it is now clear that design is concerned with concrete problems and practical solutions: the design of systems, simulations, and emergence. These ideas fall well in-line with the goals of education. Among the ideas covered throughout this review, here are some practical considerations:

- *Design learning (in design terms)*: Even though textbooks may be considered old technology, they still require careful design considerations. Avoid techniques that have questionable second-order design. For example, instead of directing students to "Pretend you don't understand and ask for clarification" (or similar instructions with vague limitations), design the task right. Create roles and scenarios. Describe situations. Design tasks that require clarification *by design*. A coin flip can be used to randomly designate "clarification roles." Minimal pairs or nonsense words can be used to practice clarification authentically and genuinely.
- *Design learning opportunities around a simple mantra*: "situated embodied problem-focused well-designed and well-mentored learning" (Gee, 2013, p. 12). TBLT and SI are both good places to start as both generally offer clear approach and technique. Teaching with games also offers active and situated learning opportunities that are already well designed.
- *Design playgrounds of limitations.* Simulations rely on limitations and abstractions. If education is a "purposeful learning process" (Egenfeldt-Nielsen, 2004, p. 17), the procedural representation afforded by simulation is key. Set limitations and allow learners to test the limits and explore solutions freely. Give learners lots of feedback and practice in stages. SI offers techniques in stages or phases and TBLT in task repetition.
- *Use games in your classes.* The *Ludic Language Pedagogy* project (LLP) is a great resource on this topic and offers detailed techniques and case studies. Role-playing games are well-designed simulations that utilize roles and abstractions to create playgrounds of limitations. Playing both with and around games (researching, playing, reflecting, and

comparing) also introduces learners to a wider knowledge base that includes purposeful and authentic engagement in a language community.

Conclusion

Design is not an easy topic to review. It is, in common language, simplified, bound with negative associations, and conflated with the philosophy of aesthetics obfuscating its concrete practicality. While the fundamentals of design are not esoteric (in fact very accessible), design ideas in education have long been trapped in the whirlwind of edu-tech trends and disregarded by the microscope of reductionist research (despite falling well in-line with the goals of education). However, design concepts like systems, simulations, and emergence have proliferated in cybernetics, new and old ideas in language education like SI and TBLT, and in the emerging fields of games and education. Furthermore, limitations and especially the concept of *playgrounds of limitations* help us reframe our common conceptions of *play* and *fun* (beyond simply the opposite of work). The potential of design literacy seems essential for educators whose jobs are predicated on their ability to design learning opportunities. This look at the role of design in education hopefully illuminates how accessible and practical design ideas are, inspires creativity and innovation among educators, and promotes criticality and skepticism towards future edu-tech trends.

BIO DATA

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