GAME DEVELOPERS' SELF-DIRECTED LEARNING TO NAVIGATE A VOLATILE INDUSTRY

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The game development industry is rapidly evolving, driven by employment trends, market shifts, and technological advancements. Game developers—individuals engaged in creating games professionally—must continuously update their skills and knowledge to remain competitive. Recent industry disruptions include widespread layoffs, shifting consumer preferences towards themed experiences, and the integration of emerging technologies like virtual reality, augmented reality, and generative artificial intelligence (GenAI). Self-directed learning (SDL) is vital for game developers navigating these changes and subsequent challenges. SDL, characterized by autonomy and intentionality, involves identifying personal learning needs, tailoring learning experiences, and fostering lifelong learning. This study explores how game developers engage in SDL for skill acquisition and enhancement. Through qualitative interviews with 11 game developers, the study investigates the motivations for SDL and the strategies used to overcome challenges. Findings reveal motivations driven by both external factors (e.g., social expectations, financial needs) and internal factors (e.g., curiosity, pursuit of excellence). Additionally, results show that game developers can overcome challenges through various processes (e.g., trial-and-error, self-evaluation) and by utilizing various supports (e.g., social, workplace). The study underscores SDL's importance in maintaining adaptability and continuous professional growth in a volatile industry.

Keywords: self-directed learning, game developers, problem-solving, change, adaptation

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As employment, market, and technology trends rapidly evolve, game developers—defined here as a broad category of anyone working on any aspect of building games as part of their professional work—must continually update their skills and knowledge to stay competitive in a dynamic, and often volatile, industry. Three major factors have continuously disrupted the gaming industry in recent years: widespread layoffs, evolving consumer interests in the gaming market, and integration of emerging technologies.

First, widescale employee layoffs have impacted—and seem likely to continue to affect—game developers, studios, and the industry at large. For example, in early 2024, Microsoft laid off 1,900 employees at Activision Blizzard and Microsoft Xbox, reflecting the industry's instability (Warren, 2024). These layoffs are often driven by changes in consumer demand and the need for companies to quickly adapt to changing market conditions. Economic pressures and the high cost of game development also contribute to layoffs as companies look to streamline operations and focus on more profitable businesses. The precarious nature of employment in the games industry highlights the importance of

self-directed learning for game developers, who must continually update their skills to remain competitive in an ever-changing job market.

Second, consumer interest in the gaming market continues to evolve, with a clear shift towards themed experiences such as dating simulators and role-playing games (RPGs). According to the *2023 Newzoo Global Gaming Market Report* (2024), the popularity of dating-themed games has skyrocketed as players seek immersive, personalized experiences that explore romantic stories and relationships. *Dream Daddy: Daddy Dating Simulator* and *Mystic Messenger* exemplify this trend by offering unique storylines and interactive dialogues catering to players' choices. In addition, the RPG genre continues to appeal to players, with games such as *The Witcher 3: Wild Hunt* and *Cyberpunk 2077* offering expansive worlds and deep, engaging storylines that allow players to take on a variety of characters and embark on complex adventures. These trends indicate a growing consumer demand for interactive and narrative-driven content that offers players a high degree of agency and personalization.

Third, the incorporation of emerging technologies such as virtual reality (VR), augmented reality (AR), and generative artificial intelligence (GenAI) into games is changing the industry landscape, offering more immersive and engaging experiences. Newzoo's report (2024) highlighted that VR gaming received a significant boost during the blockade, with players attracted to the technology's ability to create vivid, immersive environments. Games such as *Half-Life Alyx* and *Beat Saber* set the benchmark for VR gaming, demonstrating the potential for fully interactive and engaging gameplay. Similarly, AR technology is gaining traction, with games such as *Pokémon GO* and *Harry Potter: Wizards Unite* utilizing AR technology. Games such as *Wizards Unite* utilize AR technology to merge digital experiences with the real world, delivering uniquely dynamic gameplay that transcends traditional screen-based interactions. Meanwhile, GenAI tools are being tested for streamlining game development processes, albeit with mixed responses from players. These advances in VR, AR, and GenAI technologies are reshaping consumer expectations and driving demand for innovative, immersive gaming experiences—all of which impacts the expectations upon and work of game developers.

As game developers navigate changes in employment, markets, and technologies, they are left with no choice but adapt and learn to keep up. Yeo (2008) underscored that 80% of workplace learning occurs informally. That is, a substantial portion of new professional knowledge originates not from training or classes but through informal situations such as exchanging information with colleagues and searching online discussion forums. These avenues of informal learning are often opened up through self-initiated, self-guided, and self-regulated efforts steered by individual learners' motivations, objectives, and the resources available to them. Collectively, this approach to professional improvement can be characterized as self-directed learning (SDL).

Conceptual Framework

SDL is a form of adult learning wherein individuals take ownership of what and how they learn (Knowles, 1975). Two key features of self-directed learning differentiate this type of learning: autonomy and intentionality (Staudt Willet & Na, in press). Autonomy means that the individual enacts personal agency to design, develop, and direct learning activities

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for themselves (Ponton, 2009; Wagner, 2018). Intentionality means that the self-directed learner reflects on their SDL processes and evaluates whether these were successful. In a rapidly evolving industry like game development, SDL is an essential practice for workers' setting their own paths toward continuously acquiring up-to-date skills, a fundamental competence when new challenges arise, or circumstances change quickly (Morris, 2019).

SDL is built on several core principles that align well with the needs of game developers. First, SDL requires metacognition—that is, learners must self-reflect to identify personal learning needs and proactively pursue opportunities to meet them. Second, SDL is flexible, allowing learners to tailor their learning experiences to their specific goals and contexts. In the gaming industry, this flexibility is crucial as game developers must continuously adapt to new programming languages, design tools, and software updates to remain competitive. Third, SDL fosters lifelong learning, encouraging learners (e.g., game developers) to engage with new knowledge and skills throughout their careers (Garrison, 1997).

We approach the current study by framing SDL in terms of context-aware self-teaching (CAST; Staudt Willet & Na, in press). Looking at game developers' SDL in terms of CAST highlights the backgrounds, experiences, and strengths that can be drawn upon to learn, solve problems, and overcome challenges. Specifically, the CAST frame puts focus on six interrelated principles related to the autonomy and intentionality of self-directed learners:

- **Performance Objectives:** Self-directed learners pursue specific goals for their learning and improvement (Mok & Lung, 2005; Ponton, 2009; Ponton & Carr, 2012; Staudt Willet & Na, in press).
- **Starting Context:** Self-directed learners are aware of and draw from their backgrounds, experiences, and current situations to pursue learning (Higbee et al., 2012; Mok & Lung, 2005).
- **Exploration and Practice:** Self-directed learners try out new skills as they learn (Mok & Lung, 2005), becoming increasingly able to self-guide their practice.
- **Maintenance of Difficulty Level:** Self-directed learners manage the pace and complexity of learning according to their readiness to tackle challenges (Ponton & Carr, 2012), following Vygotsky's (1978) zone of proximal development. The difficulty level can fluctuate as self-directed learners take on different tasks (Mok & Lung, 2005).
- **Supplementing with External Guides:** Self-directed learners seek external guides for assistance with new or complex skills (Mok & Lung, 2005). The need for guides decreases as the learner's skillfulness increases (Francom, 2010).
- **Evaluation:** Self-directed learners analyze their progress and success of their efforts through both self-assessment and external feedback (Patterson et al., 2002).

Purpose and Research Questions

The purpose of this study is to explore how game developers engage in SDL to acquire and enhance their professional skills. An SDL approach such as CAST may be particularly important in an industry like game development that is marked by persistent

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disruptions, including widespread layoffs, evolving consumer interests, and updated applications of emerging technologies such as VR, AR, and GenAI (Newzoo, 2024; Warren, 2024a, 2024b). Although SDL is widely recognized as a critical approach in adult education and has been studied in many occupational settings, the volatile world of game development remains understudied. This gap in research calls for a deeper examination of how game developers use SDL to adapt to industry changes and continue their professional growth. Investigating the strategies and resources for SDL in the game development context can provide valuable recommendations for effective practices for professional development in this industry—with additional insights for other industries and professional learning broadly. Two research questions guide this exploration:

1. What reasons prompt game developers to engage in SDL?
2. How do game developers navigate challenges they face during SDL?

Method

To achieve the purpose of this study, we used a qualitative interview research design to explore how game developers engage in SDL for professional skill acquisition and enhancement. This methodology allowed for the collection and analysis of in-depth and nuanced insights into game developers' practices.

Participants

The population of interest for this study are *game developers*, which we define to include people working on any aspect of building games as part of their professional work. Our convenience sample contains 11 game developers from around the world. This study is still a work-in-progress, with 11 interviews completed to date (Table 1).

We recruited participants through purposive sampling to ensure a diverse representation of game developers with varying levels of experience and roles within the industry. We followed a snowball process, starting with our own professional networks (e.g., connections from Game Developers Conference), asking these connections to share the study's call for participation with their networks, and further publicizing through the online community of platform, Discord, of the International Game Developers Association's (IGDA) as well as through the Discord of several IGDA special interest groups (SIGs), such as the Devs with Kids SIG. Participants voluntarily participated and did not receive incentives or compensation.

Table 1

Interview Participant Demographic Information

Name	Sector	Role	Experience	Training
Adele	Industry	Producer, Director	1–3 years	Yes
Creative Cat	Academia	Game Developer, Academic Researcher	4-6 years	Yes
Daniel	Industry	Level Designer	More than 10 years	Yes
Dorothy	Industry	Automation, User Experience	4-6 years	Yes

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Helen	Industry	Gameplay Engineer	More than 10 years	Yes
Lily	Academia	Game Developer, Academic Researcher	Less than 1 year	No
Mana	Industry	Writer, Director	1–3 years	No
Mango Badger	Industry	Writer, Narrative Designer	1–3 years	No
Ryan	Academia	Game Developer, Academic Researcher	7-10 years	No
Scorpion	Industry	Composer, Music Designer	More than 10 years	Yes
Sean	Industry	Game Developer, Game Executive	More than 10 years	No

Data Collection

We collected self-reported qualitative data through one-on-one, semi-structured interviews. Following our institution's IRB recommendations, we obtained consent verbally to help protect participants' identities. Interviews lasted approximately one hour, allowing for detailed discussions covering topics prompted by the interview protocol. Each interview was conducted on the Zoom video meeting platform, recorded, and transcribed using Zoom's built-in features.

The interview protocol (Appendix A) contains 10 open-ended questions designed to explore why and how game developers engage in SDL. Example questions include asking about external and internal motivations for engaging in SDL while building games, any specific goals or objectives for SDL (Mok & Lung, 2005), processes of examining the resources and supports available at the start of SDL (Higbee et al., 2012; Mok & Lung, 2005), how they pursue opportunities to explore and practice new knowledge and skills (Mok & Lung, 2005), challenges encountered during SDL (Mok & Lung, 2005), places they look for help during SDL (Francom, 2010), and self-evaluation of SDL processes and outcomes (Patterson et al., 2002).

Data Analysis

We coded the interview transcripts following procedures for *thematic analysis* to identify recurring patterns in the participants' responses (Braun & Clarke, 2022). Specifically, we assigned sections of the transcripts with codes derived from the interviewees' own words. Then, in a second round of coding, these codes were synthesized into a smaller number of themes. Finally, in subsequent rounds of coding, we arranged these themes into categories that answer the study's research questions.

Results

Table 2

Overview of Results from Thematic Analysis

Research Question	Theme	Subtheme(s)
RQ1. What reasons prompt game developers to engage in SDL?	Eternal Motivations	Social Factors
		Process Factors
		Financial Factors
	Internal Motivations	Curiosity
		Openness

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		Excellence
RQ2. How do game developers navigate challenges they face during SDL?	Processes	Trial-and-Error Self-Evaluation
	Supports	Social Supports Workplace Supports Tools

RQ1. What reasons prompt game developers to engage in SDL?

Interview participants reported engaging in SDL for a variety reasons, stemming from both external and internal motivations. We describe these themes in the following paragraphs.

External Motivations

Although all participants described external motivations for pursuing SDL, the specific reason underlying these external motivations varied. The game developers we interviewed described these motivations in terms of social, process, and financial factors.

Social Factors

Participants described a desire to improve in game development for a variety of social factors. Several mentioned wanting to perform to meet social expectations. For example, Dorothy's social motivations drew from their personal relationships; they described being mainly motivated by their family norms and values.

Many of the other participants' social motivations were in a professional context. For instance, Helen described the joy of building and sharing one's work with others, and they were eager to prove themselves and contribute to their work team. Paired with this, Helen also desired admiration, the fulfillment of showcasing achievements, and the intrinsic satisfaction of engaging in creative and meaningful activities. When Dorothy reflected on her end goals for SDL, she said: "I'm thinking about it not just for me, but in a way that I'm able to express and connect with somebody and communicate with somebody over it and have a connection or some kind of shared goal." Likewise, Ryan reported wanting to fulfill the expectations of various stakeholders, despite the difficulties of making voice input commands work on different platforms with different programming languages: "I need this function, and I've had this request from a stakeholder... that kind of drives you to want to find out how to do it." Similarly, Mana found their external validation in teamwork and witnessing others' excitement for their work, which fuels their own energy and commitment to the project. They elaborated:

> With game development too, it's a very team-oriented project. Like, yes, you can be a solo game dev. But, it's like when you have a bunch of people with very specific skills all working together, you can just really accomplish something that no one person could do on their own. I want to do right by people, to do my part, so that they

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can do their part, and we can all look at this thing at the end and be like, wow, I was part of that.

Sometimes, social factors took the shape of more expansive possibilities and the extension of social connections. For instance, Scorpion attributed their access to the industry and early success to people they had met; their journey into composing music for games began with meeting someone whose uncle work at a game studio. Once in the industry, Adele described how helpful it was to observe peers who had left game development to become aware of industry dynamics and realize the importance of avoiding burnout and sustaining motivation. Likewise, Mana also commented on the benefits of peer observation: "I get invigorated to do my job by watching other people doing their job and enjoying it."

Process Factors

Interviewees also described being motivated toward SDL by factors related to the processes of game development. For example, Daniel noted that "Every project is unique," and they wanted to serve the needs of the project to "make things ship smoothly." Similarly, Dorothy asked herself, "How can I get to my end goal with as least friction as possible without bothering people in the interim?" Helen described starting with a simple foundation, gradually building complexity by integrating additional systems, and then identifying the need for new systems to address challenges, track progress, and establish metrics for evaluation.

Some participants described process factors in terms of desired outcomes. For instance, Ryan reported needing SDL to overcome the technical issues that they encountered during the game-building process. Adele, in their role as a game producer and director, considered the bigger picture of development processes: that games have distinct advantages as a storytelling medium and it is worth figuring how to leverage games for this purpose: "that writer mentality of you want to be part of this conversation that's already been going on for a long, long time." Likewise, Mana spoke about how they are motivated by the opportunity to contribute to an ongoing "conversation" in creative industries and leave an impact through storytelling in games.

Several participants linked their approaches to navigating challenges associated with SDL to the complexity of the challenges and the game dev's role and experience level. For example, Scorpion and Sean, who have each worked in the games industry for more than 10 years, identified the focus of their work and SDL attending to complex challenges, cutting edge technologies, and big picture considerations. Daniel, another industry veteran of more than 10 years, also reported that different learning occurs by career stage. Specifically, they mused that early career learning was about software and processes, mid-career learning has been about content, and late career will be a mix of roles, both individual contributor and manager.

Financial Factors

As a third area of external motivations for SDL, participants noted several practical, financial considerations. For example, Scorpion transitioned into the games industry during a period of economic recession, and they noted how having a stable job during a recession

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provided the foundation to explore their interests—through SDL—in a sustainable way. For Dorothy, personal realities such as a hidden disability meant that SDL for game development was essential for survival, because continuous skill development and improvement enabled them to find a job after a period of unemployment.

Internal Motivations

Participants also described various internal motivations for pursuing SDL. Interviewees described these motivations in terms of curiosity, openness, and excellence.

Curiosity

Numerous participants identified curiosity as an important internal motivation. For instance, Scorpion identified curiosity as an essential driver of SDL: "The key to art is curiosity." This internal drive led to Scorpion's exploration and innovation in audio implementation and music composition. Dorothy paired curiosity with empathy—a curiosity of what life and experiences are like for other people. Helen expressed curiosity in terms of being driven by inspiration and personal expression. Similarly, Mana described being driven by a love of creative expression, adding to this the desire to try new things and explore new mediums for storytelling. Providing the overview for SDL while creating a new game, Mana said:

> Even with this game, we're working on a murder mystery… I've always been told that I've been a mysterious stylistic writer, but I've never written a murder mystery where the whole point is people killing each other and figuring out why… I doubt I'm really going to ever be excited to write a murder mystery again because once I've done it once, I want to try something a little bit different.

Openness

Another internal motivation for game developers' SDL was openness—a willingness to learn, to process new information, and a belief in themselves to figure things out along the way. For example, although Scorpion admitted, "I have no idea what I'm writing," they nevertheless relied on their good ear and musical knowledge to move into uncharted territory, showing a willingness to navigate uncertainty and grow through experience: "I guess I just pull from the source of curiosity and knowledge to create something that I think feels and sounds good." Adele demonstrated similar humility and openness to learning, willing to draw from the different skillsets of their team and expand their knowledge through collaboration:

> I felt like I could learn a lot from working with 3D people, working with 2D people, working with a writer, working with composers, working with sound effects, voice actors. There's so much you can learn from games. It really depends on how big you want your game to be.

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Several participants identified the pursuit of excellence as an important internal motivator for SDL. Dorothy described this as feeling like there is a driving force to build and create and do things well; Scorpion wanted to create work that "feels and sounds good. Similarly, when reflecting on developing the professional skills and communication expertise to better manage projects and work with diverse collaborators, Mana reflected: "The internal motivation is that I want to do well at whatever I'm doing."

Related to the pursuit of excellence were participants' self-reflections on the improvement needed to achieve excellence. For example, Ryan seemed to be propelled by a personal desire to gain confidence and have a sense of achievement when solving problems in the game-building process; they explained, "The more I can go into something and tweak it, the more it's easier for me to understand it, probably for most people." For Scorpion, improvement to the desired level excellence in musical composition required returning to school:

> This is audio implementation that I actually didn't know I was doing. So, I went back to school, and I said, okay, I'm going to be a video game composer, because I figured I have to relearn theory again. I have to learn everything properly and go through the process to compete at like a film-composer level.

Finally, Adele added a slightly different perspective on how excellence might be measured—through the enjoyment of the journey and not just the destination:

> I wanted to make a game just because I wanted to have a shared experience with my friends. As they play along and experience a story that I created, we'd enjoy it together. Well, you know, talking together about it, watching them play it, seeing their reactions.

RQ2. How do game developers navigate challenges they face during SDL?

Interview participants reported navigating challenges faced during SDL in a variety of ways, with focus on either processes of navigation or supports for navigation. We describe these themes in the following paragraphs.

Processes of Navigating Challenges

Although all participants described various processes for navigating challenges during SDL, we identified two primary themes: trial-and-error and self-evaluation. We describe these processes in detail below.

Trial-and-Error

Participants frequently mentioned using a trial-and-error approach to navigate challenges during SDL. For instance, Ryan noted the opportunities inherent to SDL, even when encountering challenges: "Past hurdles I've overcome mediate how outside the box I can think." Furthermore, Ryan reported facing significant challenges during SDL, particularly related to time management, complex technical problems, and scarcity of feedback. In response to these challenges, they described forming a broad ecosystem of human-sourced (e.g., personal connections, online social networks) and machine-sourced

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(e.g., generative AI tools, online repositories) supports to help them overcome setbacks and obstacles, enabling them to continue learning and adapting in a fast-paced industry. Scorpion, despite their skills and education, navigated periods of uncertainty in their work, relying heavily on curiosity and experimentation to move forward. They emphasized the value of trying different approaches and learning from both successes and failures. Similarly, Daniel highlighted the difficulties of moving into unknown domains, such as using emerging technologies and working within less structured indie projects. To manage these challenges, Daniel adopted a systematic approach: searching Google for solutions, watching short-form YouTube tutorials, consulting friends with relevant experience, and utilizing community-created resources.

Self-Evaluation

We identified self-evaluation as another crucial process through which game developers navigated challenges during SDL. Daniel's reflection on completing ongoing projects using new tools exemplifies this process: "So through these last years, I have a lot of projects that are kind of midway through. So now my objective is to finish up that work using these new tools." For Ryan, self-evaluation involved making sense of the broader game development community and connecting this understanding to their professional identity development.

Dorothy relied on self-reflective practices to navigate barriers tied to societal assumptions and privilege when she was a first-generation college student. They described how being dismissed with phrases like, "It's a blonde moment," or dealing with judgments about the validity of certain questions they had asked made them hesitant to engage fully in learning. Over time, they recognized the importance of self-reflection for the perseverance and resilience necessary to challenge societal stereotypes and address miscommunications in learning environments. Likewise, Scorpion and Adele emphasized the importance of continuous self-improvement and long-term goals, often by returning to school, leveraging curiosity, and seeking feedback through forums and other platforms. Mana cited personal growth and team achievements as measures of success and reinforced the importance of humility and a willingness to learn: "Thinking that even what you're good at, you're the best at, is one of the worst mentalities I think a person could get into."

Supports for Navigating Challenges

Interview participants also reported navigating SDL challenges by relying on various support. We categorized these into social supports, workplace supports, and tools.

Social Supports

Social supports played a vital role in helping participants navigate SDL challenges. For example, Scorpion highlighted the importance of social networks for creating opportunities and opening up possibilities, such as the uncle of a coworker who provided mentorship and internship opportunities when they were still working at LensCrafters prior

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to shifting careers fully into the game industry. Daniel agreed with the significance of social supports in solving problems, but also noted the shifting availability of remote colleagues:

> People would say, like, "We're here to help. Let us know whenever you need any help." But I feel like because of the nature of remote work, people are not really available in the way that they would like to be available.

Adele and Mana, who work together as part of a fully remote game dev team, disagreed with Daniel's sentiment; they described how they rely on collaboration with team members, utilizing their wide networks of creative professionals and seeking advice from those with more experience in specific areas.

Workplace Supports

The resources available in the workplace were key for participants for overcoming challenges associated with SDL. For instance, Scorpion described benefitting from the job experiences and transferrable skills gained from a past job even though the work was in internet media, not the game industry. They commented that most helpful aspect was simply that the workplace provided a stable platform from which to explore creative endeavors. Later, an internship provided Scorpion practical experience in game audio. Adele and Mana talked about their indie team in a way that suggested that the makeup and culture of the team was a workplace support in itself. The structure allowed for team members' flexibility and resourcefulness, highlighting the collaborative nature of their work and the importance of mutual respect and shared enthusiasm in overcoming challenges. They emphasized the power of being upfront about one's knowledge base and limits, which fostered a collaborative environment where egos do not get in the way of progress.

Tools

Participants noted that having the right tools was essential for managing SDL challenges. Dorothy commented that "the technology and the application get conflated a lot," meaning that understanding tools as support is more about the functionality than the specific device or platform. For example, to share their work, receive feedback, and connect with collaborators, Scorpion used game development web forums. Similarly, Adele and Mana mentioned forums, podcasts, and game development communities as valuable spaces for learning and sharing knowledge. Mana explained their procedure:

> So that typically is like step one is trying to talk to other people you know. Step two for me is once you have at least an idea of an idea of what you need to know, you hit your Google, you hit a podcast, you go find resources like the game developers groups. It's even before necessarily knowing what you need to do, just sort of immersing yourselves into those spaces so that you're casually absorbing information even if you don't need it yet.

All the participants talked about applications to support their technical work, which would be a given considering video-game development requires digital tools. Still specialized applications were useful, such as Scorpion's use of the platform Mugen for their earliest experimentation with game audio when they were 19 years old. Such tools were key supports for game developers' self-guided exploration as part of their SDL.

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Discussion

Several themes from our findings regarding external motivations resonate with the motivations identified by McCartney et al.'s (2016) research on computing students. Participants in the current study often pursued SDL out of necessity, aligning with McCartney et al.'s "Subtheme 1: I Just Had to Make It Work" (p. 6). For instance, Ryan's commitment to fulfilling stakeholder expectations despite technical challenges was mirrored by participants from McCartney et al.'s (2016) study who felt compelled to push through obstacles. Additionally, the influence of projects as a motivator was evident, with some developers, such as Mana and Adele, engaging in SDL as part of their game development processes, resonating with "Subtheme 3: Making Up Projects so I Can Learn" (McCartney et al., 2016, p. 6). This proactive approach to SDL demonstrates a commitment to honing their craft and aligns with our findings on external motivations. Peer and social influences also played a significant role for the participants in the current study, which aligns with McCartney et al.'s (2016) "Subtheme 7: I Don't Want to Let Them Down" (p. 7), as illustrated by Helen and Mana's emphasis on not just meeting but exceeding the expectations of their teams and stakeholders.

Findings about internal motivations in the present study also connect to McCartney et al.'s (2016) themes. For instance, the joy of learning and a desire for personal growth were primary motivations, consistent with "Subtheme 12: I Love to Learn" (p. 9) and "Subtheme 13: I Want to Grow" (p. 9). Many participants in the current study, such as Scorpion and Mana, highlighted their intrinsic curiosity and love for creative exploration. However, internal fears also drove SDL, with Dorothy and Scorpion acknowledging a fear of inadequacy or judgment, paralleling McCartney et al.'s (2016) "Subtheme 14: I Was Afraid I'd Look Like a Fool" (p. 9). Our findings suggest that both internal and external motivations are deeply intertwined in driving SDL among game developers, with each influencing the other in complex ways.

Past research has highlighted a reciprocal influence between game developers and their occupational community (Dubois & Weststar, 2022; Weststar, 2015). In this dynamic relationship, game developers contribute to and are influenced by the norms, values, and practices of the community, leading to shared identity and mutual growth. In the current study, Ryan echoed this sentiment as they sought to make sense of the overall game developer community—connecting the process of making games to their own professional identity development.

As a mid-career game developer, Daniel reflected that different types of learning happen in different career stages as the need for and focus of learning changes in the stages. To catch up with the game content and rapid changes in the world (e.g., technology), it is essential to know what is needed to learn and adjust the learning content. This finding is aligned with Brown et al.'s (2012) article that highlighted adaptive adults engaged in both formal and informal learning to develop career adaptability competencies, with the focus of their learning evolving over time to align with different stages, occupations, and sectors.

Dorothy described how they will seek help when they meet challenges in the SDL process and talked about the use of AI—which holds both possibilities and perils. Dorothy highlighted concerns about consent, transparency, and ethical implications of AI and

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emphasized its dual potential for progress and harm while reflecting on the challenges of distinguishing technological innovation from its applications. Similarly, Lin (2024) mentioned that AI tools (e.g., ChatGPT) can support adult learners by helping them establish learning goals, find resources, create customized learning plans, track their progress, and reflect on their learning journey, thereby facilitating the successful accomplishment of SDL. This finding highlights that AI can be used as a useful tool in SDL even as the ethical issues need to be taken into consideration.

Implications

Understanding and promoting self-directed learning (SDL) among game developers is essential for several key reasons, as our findings and discussion have shown. First, the game industry is characterized by rapid technological advancements and shifting consumer preferences, necessitating continuous skill development and adaptation. Developers who engage in SDL, driven by both external motivations such as project demands and peer influences, as well as internal motivations like curiosity and the joy of learning, are better equipped to keep pace with these changes. By fostering SDL, we aim to enhance game developers' professional growth and resilience, enabling them to thrive in a competitive and evolving market.

Second, the high turnover and frequent layoffs in the game industry highlight the need for developers to maintain a versatile and up-to-date skill set. Our study showed that game developers can engage in SDL to navigate job transitions and align their learning with industry trends and career aspirations. Emphasizing SDL can mitigate the adverse effects of industry volatility, providing developers with the tools to sustain their professional development and increase their employability and career longevity.

Third, our findings underscore the broader implications of SDL for the innovation and growth of the game industry. Encouraging developers to engage in continuous learning and knowledge sharing fosters a culture of innovation and collaboration. Developers who actively seek out new skills and ideas, driven by motivations such as the pursuit of excellence and a desire for personal and professional growth, are more likely to introduce novel concepts and technologies into their work. Promoting SDL is critical to creating a dynamic and forward-thinking industry, ultimately benefiting both developers and consumers.

Limitations and Future Research

As a qualitative interview study, this research was not intended to be generalizable or reflective of trends among all game developers. Rather, our aim was to explore and report the possible experiences and practices of developers. Still, our sample drew from our own professional networks, with only a few degrees of separation. This means that it is likely that participants were more likely to be associated with the non-profit International Game Developers Association (IGDA) and adjacent to academic circles. Our participants shared a rich variety of insights, but these might not capture the full range of developer experiences. Future research should seek to understand developers working in the largest studios on the most cutting-edge games. The massive size—and competitive nature—of these companies would likely necessitate a different pace—if not different kind—of SDL to keep up and keep

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innovating. Also, the current study relied on self-reported data collected from a single interview. Future work should utilize longitudinal methods (e.g., diary studies), naturalistic inquiry (e.g., scraping game developers web forums to analyze the content of discussions occurring naturally), or interventions (e.g., SDL training).

Conclusion

The findings from this study deepen understanding of the complexities of self-directed learning (SDL) among game developers in a rapidly evolving—and often volatile—industry. In the face of widespread layoffs, shifting consumer interests, and the integration of emerging technologies, SDL emerges as a crucial strategy for professional growth and resilience. The motivations driving SDL identified in this study—ranging from external factors such as stakeholder expectations and team collaboration to internal drivers such as curiosity and the pursuit of excellence—highlight the multifaceted nature of learning in this context. This study underscores the importance of SDL in enabling game developers to remain adaptable and competitive, particularly in an industry marked by high turnover and technological innovation. Moreover, our insights and implications suggest that SDL not only empowers individual game developers to enhance their employability and navigate career transitions but also fosters a culture of continuous learning and innovation within the game developer community. These findings highlight the critical role of SDL in supporting the ongoing evolution of game design and development practices, ultimately benefiting both developers and the broader gaming industry. Finally, this study can contribute empirical data to enhance and validate a context-aware self-teaching framework, advancing both theoretical and practical applications useful for rapidly changing fields where SDL is especially needed.

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Appendix A: Interview Protocol

The purpose of this study is to explore how game developers engage in SDL to acquire and enhance their professional skills. Two research questions guide this exploration:

1. What reasons prompt game developers to engage in SDL?
2. How do game developers navigate challenges they face during SDL?

Verbal Consent:

Hi, my name is Bret Staudt Willet.

I want to tell you about a research study we are doing. In this study, we want to find out more about how game developers engage in self-directed learning to acquire and enhance their skills. I am asking you to be in this study because you are a professional working in the games industry.

If you agree to participate, I will ask you to answer some questions about your own experiences and processes of learning in the video games industry. Your involvement in the study will last less than one hour. If you want to stop at any time, just tell me and we will stop. You don't have to be in this research study. You can say yes now and still change your mind later, at any point.

I will make an audio recording of your responses. Later, I will share a transcript of the interview with you to check that you said what you intended to say.

The risk of participating should be minimal. However, because this is a research study, there may be risks that are unforeseeable, but these should be no greater than those ordinarily encountered in daily life. Possible risks include the loss of confidentiality despite the steps taken to protect participants' identities. An additional risk includes the possibility of feeling discomfort with the interview questions, but these questions are typical of those that would be discussed within your industry and workplace.

Would you like to continue? Is it ok if I begin the audio recording?

Background: Briefly, please tell me why you wanted to start making/building games.

- *What made you decide to be a game developer?*
- *What has been your favorite part of making games?*
- *How long have you been making games?*
- *When and why did you decide to pursue game development as a profession?*
- *When and why did you start your current professional role?*

Q1: What are your <u>external</u> motivations for engaging in self-directed learning as you build games? [RQ1]

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- *What are the driving external forces?*
    - *Stakeholders? (end users, bosses, instructors)*
    - *Contextual factors?*
    - *Salary and benefits information?*
- *Any specific examples or stories you'd like to share?*

Q2: What are your internal motivations for engaging in self-directed learning as you build games? [RQ1]

- *What are the driving internal forces?*
    - *Technical skills?*
    - *Curiosity?*
- *Any specific examples or stories you'd like to share?*

Q3: When you set out to learn something on your own, do you have specific goals or objectives in mind? [RQ2]

- *If yes, how do you decide what those goals and objectives are?*
- *If you have more than one, how do you prioritize them and decide where to focus on first?*
- *If no, how do you decide what to do?*
- *Any specific examples or stories you'd like to share?*

Q4: Where do you start? [RQ2]

- *Objectives and Outcomes*
- *Assets and Resources?*
- *Existing knowledge, skills, and abilities?*
- *Background and experiences? Past projects and products?*
- *Relationships and communities*
- *Any specific examples or stories you'd like to share?*

Q5: How do you practice new knowledge and skills? [RQ2]

- *What opportunities have you had to explore, try things on your own, adapt, tinker, etc.?*
- *What has been the role of practice?*
- *Specific tools or platforms?*
    - *What features do you look for?*
- *Exploration for specific objective or general use for later?*
- *At what scale? Bite-sized or big picture?*
- *Any specific examples or stories you'd like to share?*

Q6: What challenges have you faced? How did you deal with them? [RQ2]

- *Choices to delay new knowledge or skills?*
- *Choices to favor exploration, practice, learning, and skill development?*
- *How do you manage your time and resources when engaging in self-directed learning, especially when faced with multiple demands?*

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- *What strategies do you use to stay motivated and persistent when learning on your own?*
- *Any specific examples or stories you'd like to share?*

Q7: Where have you looked for help? [RQ3]

- *Human sources—who do you know?*
- *Human sources—what online networks are open to you?*
- *Machine sources—AI, LLMs?*
- *How do you decide where to look and which help to choose?*
- *Any specific examples or stories you'd like to share?*

Q8: How has all of this self-directed learning gone? [RQ3]

- *How do you know if you've successful?*
- *What factors influenced your evaluation of success?*
- *How did you decide whether to be done or keep searching?*
- *Any specific examples or stories you'd like to share?*

Q9: How could the industry or your workplace better support your self-directed learning?

- *Any specific examples or stories you'd like to share?*

Q10: Any other lessons you have learned that you continue to apply? [RQ1]

- *Anything else that you would like to share?*

Would you like to select a pseudonym?

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