

Investigating Social Media Potential for Supporting Teachers' Digital Games Literacy

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Abstract: Digital games have the potential to address a variety of pedagogical objectives across a range of subject areas in education and research shows that teachers are interested to learn about the use of games in teaching. However, due to the lack of professional development opportunities, teachers typically learn about the use of games informally from their peers and on social media. This raises questions about the kind of knowledge that social media resources may be catering to teachers and their relevance for more formalized ways of game literacy development. Further, the reason for the lack of professional development options could be that research is lagging behind in testing and developing systemic models that frame teachers' knowledge of game-based learning such as the recently proposed Game Literacy for Teacher Education (GLTE) framework. To address the research gap, we investigate the following question: How do social media resources address key literacy areas of the Game Literacy for Teacher Education framework? The study tests the GLTE framework to investigate the research question. Data has been collected between autumn 2021 to spring 2022 from YouTube, Twitch, and Twitter using 1) search words in English, German and Swedish, 2) built-in recommendations and discovery functions, and 3) following links and references. Data relevant to supporting teachers in Digital Game-based Learning (DGBL) at primary and secondary levels in education were included, and 150 multimedia resources were selected for further analysis. Data were deductively coded onto the broad categories of the GLTE framework and descriptive coding was used to explore new categories. Findings show that DGBL resources shared on social media address the key literacy areas of the GLTE framework at least partially while also indicating that conceptualisations of games literacy for teachers need to go beyond technological and pedagogical integration and consider the broader societal role of games and gaming. Based on the findings we propose that game literacy for teachers is conceptualised from a broader social-cultural, critical perspective, and we suggest an updated model and recommendations for future research.

Keywords: games literacy, K-12 education, teacher games literacy, social media, informal learning

1. Introduction

Digital games have the potential to address a variety of pedagogical objectives across a range of subject areas in education (Hailey et al, 2016) and teachers indicate an interest in learning about how to use games in their teaching (Takeuchi & Vaala 2014; Máthé, Verhagen & Wiklund 2019). At the same time, there is a lack of professional development opportunities, which could be due to that research is lagging behind to develop and test systemic models that could frame teachers' knowledge and guide professional development programs in game-based learning (Foster & Shah 2019). The recently proposed Games Literacy for Teacher Education (GLTE) framework attempts to address this gap (Chen et al, 2020). Based on data collected from educational stakeholders, the framework proposes five key literacy areas: practical capabilities in instructional design for game-based learning; evaluation of game-based learning; organisation and management; general basic game literacy skills; and high-level game literacy skills. The authors call for further confirmation, testing, and updating of GLTE. At the same time, teachers report that they already learn informally about the use of digital games from their peers and on social media, driven by their own interests (Máthé, Verhagen & Wiklund 2019). This raises questions about the kind of knowledge that social media resources may be catering to teachers and their relevance for more formalized ways of games literacy development. Hence, we investigate the following research question:

Research Question: How do social media resources address the key literacy areas of the Games Literacy for Teacher education (GLTE) model?

1.1 Digital literacy for teachers

Traditionally, digital literacy has been conceptualized as skills to access the internet, find, manage and edit digital information and engage with online information and communication. For teachers, this meant properly using and evaluating digital resources, tools, and services and applying these to the learning processes. (Gilster 1997). The appearance of personal mobile devices and ubiquitous access to the internet challenged this perspective as students started to learn, communicate, and participate in digital worlds within and outside school contexts

(Smahel et al, 2020). For teachers, this means, they now need critical digital literacies that consider safety, privacy, ethical issues, communication, equal access, computational thinking, data usage, and analysis abilities of media messages, thus going beyond basic technical skills, information literacy practices, and media understanding. Moreover, teachers need to recognize possibilities such as gaming and creative digital expression, which are often an essential part of students' lives. This requires updating teachers' digital literacies (Gouseti et al, 2021).

1.2 Game literacy

Game literacy has been approached through various lenses in research. From an operational viewpoint, game literacy is the ability to access the engaging properties of games, motoric skills, cognitive processing, and rapidly scanning virtual spaces (Prensky 2001). From a cognitive standpoint, game literacy means that players understand the procedural rhetoric of games created by the designers, which requires systems-thinking, knowledge of rule systems and algorithms (Zimmerman 2008), pattern recognition, thinking about mathematical models, and seeing the world through dynamic relationships (Salen 2007). Also, literacy emerges in specific contexts intertwined with the practices of social groups and classes (Gee 2003). These social and cultural dimensions of game literacy include criticism and evaluation, knowledge about games, and the world outside the game and the game player (Apperley & Beavis 2013). Squire (2008) proposed that game literacy's essential element is the ability to participate actively, create games, and be adept at manipulating games.

For Tao (2009), game literacy also involves affective dimensions, experience, and skills. It entails a mindset and an emotional involvement, the ability to control one's own emotions and use the game playing to enrich and develop oneself. For Klimmt (2009), game literacy includes respect for the game rules and the knowledge of how to avoid violence and addiction. An integrative view has been proposed by Bourgonjon (2014) which combines the operational, critical, and cultural dimensions. The operational dimension refers to the ability to play and design games, have the technical skills to install and launch games, navigate through a virtual world, and interpret what happens during the game. The cultural dimension refers to games as cultural artefacts, the ability to position, interpret and discuss games in the context of other media, and as a form of artistic expression in specific cultural contexts. The critical dimensions of game literacy require the knowledge that games are socially constructed, a reflective attitude on power relations, inequality, and the different and conflicting perspectives around game culture.

1.3 Game literacy for teachers

There has been less focus on teachers' game literacy in research. The Games Literacy for Teacher Education (GLTE) framework aims to address this gap. Based on empirical data from a systematic literature review, interviews and surveys with teachers, researchers, and experts in the field of educational technology and teacher education, the framework proposes five literacy areas (Chen et al. 2020). These include:

1. Instructional design: teachers' ability to create games for learning, and design game-based curricula, activities, teaching resources, and the learning environment, which requires design thinking,
2. Evaluation: taking critical perspectives before implementing games, carefully evaluating and critiquing games, existing empirical evidence, and observing the learning process,
3. Organisation and management of GBL: implementation of GBL in the class, directing students' focus on the learning content, managing unexpected events and requests, controlling the length of gameplay, and managing the class schedule while avoiding unnecessary delays,
4. Basic game literacy; knowledge of games, having basic technological knowledge, and being able to access, experience, and manipulate games, and
5. High-level game literacy: game-thinking, game spirit, and having a game identity.

In summary, the GLTE model integrates technological, pedagogical, and organizational aspects of teachers' game literacy and highlights the importance of the teachers' disposition and mindset (Chen et al, 2020).

1.4 Social media for games and teacher professional learning

Social media have seen an increasing role in teachers' professional learning (Kimmons, Rosenberg & Allman 2021). They have been used to exchange resources, build communities, and meet individual needs otherwise not met in traditional professional development settings. On social media, teachers commonly exchange resources, practices and strategies, new classroom ideas, and insider stories on how to best implement these strategies (Greenhow, Galvin & Bret Staudt Willet 2019). Teachers can manage and control their own learning, easily access resources on an as-needed base (Greenhalgh & Koehler 2017), connect with networks much

broader than in their face-to-face settings and find more contacts with teachers with similar or diverse experiences and perspectives (Trust, Krutka & Carpenter 2016).

Social media play a vital role in gaming as well. Major platforms with an immense amount of game-related content include for example Twitch which is prominently focused on gaming. Twitch features live channels that stream various games, users can participate in a live chat during video broadcasts, and the broadcasters frequently react and reply to comments and questions in real-time. Game studios use Twitch for advertising and they cooperate with top streamers with millions of followers. Twitch has been addressed in educational research regarding synchronous community building, on-stream interactivity, and gamification to improve traditional academic MOOC courses (Steinbeck, Teusner & Meinel 2021). Another social media platform with significant game content is YouTube. It is the most comprehensive online video platform worldwide where users can watch gaming content including game trailers, behind-the-scenes videos, tutorials, and walkthroughs. It is also one of the most influential channels for game marketing and hosts many gamers with a massive fan base.

On Twitter, a leading social networking and microblogging service worldwide, players can share quick updates and tidbits about games, and connect and interact with fellow players worldwide. They can post short text messages and follow other users via update feeds. Game studios also use Twitter to stay in touch with their fans.

Considering that social media are relevant for teacher professional learning as well as game content, they can provide spaces where teachers can learn about games, join relevant teacher and game-related communities, connect and exchange experiences of DGBL with peers.

2. Research strategy

The study investigates the research question using a survey research strategy and document analysis in which documents shared or referred to were treated as the primary data source. These documents may be traditional texts such as books, articles, and reports, or digital texts such as webpages, blogs or social network postings, as well as non-textual sources such as pictures or videos (Denscombe 2014; Bowen 2009). This study uses the collective term “resources” when referring to texts and online audio-visual sources. Evaluating online resources has been a central question, and judgments need to be made regarding the authoritativeness, trustworthiness, up-to-datedness, and popularity of these online resources (Denscombe 2014).

2.1 Data collection

The social media sites YouTube, Twitter, and Twitch, have been selected for this study, considering their significant public availability, game-related content, and relevance for gaming and learning. Facebook and Discord have been also considered for the study, however, relevant groups had access restrictions and required administrator approval, hence these sites did not meet the requirements for publicly available data. Instagram and Twitter are comparable in terms of allowing uploading audio-visual information, using limited amount of texts, and following hashtags. However, on Instagram, the professional and private life of teachers are blended (Carpenter et al, 2020), while Twitter is rather used in a professional context among educators. For this reason, we omitted Instagram in favour of Twitter (Carpenter et al, 2019).

Data was collected between the autumn of 2021 and the spring of 2022 in several iterations by 1) using search words in English, German, and Swedish, 2) using inbuilt recommendation and discovery functions, and 3) following hyperlinks and references. Hence the search strategy combined researcher-defined manual search with algorithmic solutions of the platforms. Forward and backward snowballing and pearl-growing search methods were used by following hyperlinks, hashtags, and recommendations. The predefined search words included words and phrases such as “game-based learning,” “games”; “education”; “teaching with games; “games in school,” and “games in teaching” in the targeted languages.

The data collection was conducted using Mozilla Firefox and the Container extension, preventing cross-referencing. The search process started by reviewing the platform-specific search and discovery tools. Then the researcher initiated the investigation on the platforms with the pre-defined terms and investigated the search results for inclusion. Data were included if they addressed digital game-based teaching and learning relevant for primary and secondary education levels, were publicly available, and corresponded with our ethical considerations. Analog games were not considered for this study, and data older than ten years and data with broken hyperlinks or lacking information on their publisher were excluded. Data that matched the criteria were saved using the social bookmarking service Pocket. The data collection was carried out within the time limit of

the study until the search did not reveal any interesting findings. When relevant, the researcher investigated the source of the data. For example, documents or videos shared on social media were traced back to their sources when possible, such as the publishing organization's websites. Finally, data were organised for analysis in a spreadsheet that contains a unique identifier and a link to the online location of the resources. Altogether 150 resources were selected for inclusion in the final dataset, including textual and non-textual material.

3. Ethical considerations

This study follows the guidelines set by the Norwegian National Committee for Research Ethics in the Social Sciences and the Humanities (The Norwegian National Research Ethics Committees 2019). As there are no general rules, it is recommended to take a case-based approach and consider accessibility, the sensitivity of the information, the degree of interaction, and subject vulnerability (Elgesem 2016).

In this study, publicly available data has been collected from selected social media. Posts of private individuals, even if openly available, were excluded from the study. However, the study includes data from public figures who have over a thousand followers or subscribers, produce content professionally, are active regularly, and may receive financial contributions.

The sensitivity of the data was also evaluated. One issue considered was that non-text material such as images or videos should not contain sensitive information about children. Other than that, the data should consist of non-sensitive information available to the public. Data with restricted access were not collected. Furthermore, the researchers' degree of interaction on the social media platforms was low as we did not engage in conversation or observe peoples' behaviour online. Thus, the subjects' vulnerability was assessed as low, as were the overall ethical risks involved in this study.

4. Data Analysis

The study uses a mixed approach to data analysis combining deductive and inductive methods and using solo coding. The process started with lean coding based on three broad categories of the GLTE framework, namely 1) practical game-based teaching (consisting of instructional design, evaluation and management), 2) basic game literacy, and 3) higher-level game literacy. Higher-level game literacy is described as the attitudes and characteristics of teachers. As this study investigated online documents, the deductive approach did not reveal information related to personal characteristics. Therefore, we used descriptive coding, also called topic tagging, as it is an approach that is well suited to analyse documents and artefacts for a detailed inventory of their content by summarising the topic of a set of qualitative data in a word or a short phrase to prepare the ground for further in-depth analysis (Saldana 2021). For example, a website about game reviews received the descriptive code "game review." The analysis process was conducted in two phases. In phase one, emerging codes were generated from the readings of the data. The codes were added to a codebook with general code descriptions and data items were tagged and described with one or more codes. Altogether 110 codes were created. When new data suggested a new code, the code list was revisited to check for consistency. Notes were kept and developed into mind maps to visualize the emerging codes. The codes that seemed to cluster together were arranged under larger groups with descriptive topic names. In the second phase of the analysis, the topic areas were compared and contrasted to previous literacy models to verify new topics not found in the GLTE framework.

5. Findings

The search showed different stakeholders sharing resources and information relevant to game-based learning on social media, especially YouTube and Twitter. The Twitch search resulted in a few hits from direct searches, and channels were identified by following hyperlinks elsewhere. We included 150 resources shared by 30 different stakeholder groups, mainly from the US, UK, Sweden, and Germany, in 52 content areas, including 180 digital games. Findings show that various stakeholders on social media share resources that support the implementation of digital games in teaching. These stakeholders include commercial as well as non-profit organizations, multi-stakeholder federations, professional associations and public institutions such as universities, libraries, museums, organizations on the European level, and individual teachers and researchers. The resources range from simple to complex, such as a single lesson plan to more comprehensive guides and online training courses. Games or game-based learning is the full or a partial focus of the stakeholders' activities.

The resources can be arranged into eight broad topic categories: 1) Design for DGBL; 2) Game use; 3) Games in Society; 4) Professional learning and Knowledge Sharing; 5) Research 6) Health, Wellbeing, and Safety 7) Values; and 8) Collaboration / Community (see Figure 1).

Topic 1 corresponds primarily to the Instructional Design, Management and Evaluation, and Topic 2 to Basic Game Literacy dimensions in the GLTE framework. However, we re-named these for our purposes with more illustrative names. Topics 4, 5, and 7 address to various degree, at least partially, the GLTE framework. These topic areas have overlaps and are thus not strictly separate. Nonetheless, they highlight different essential aspects of the resources. Topic 3, 6 and 8 we could not directly identify in GLTE. Below we go in more detail.

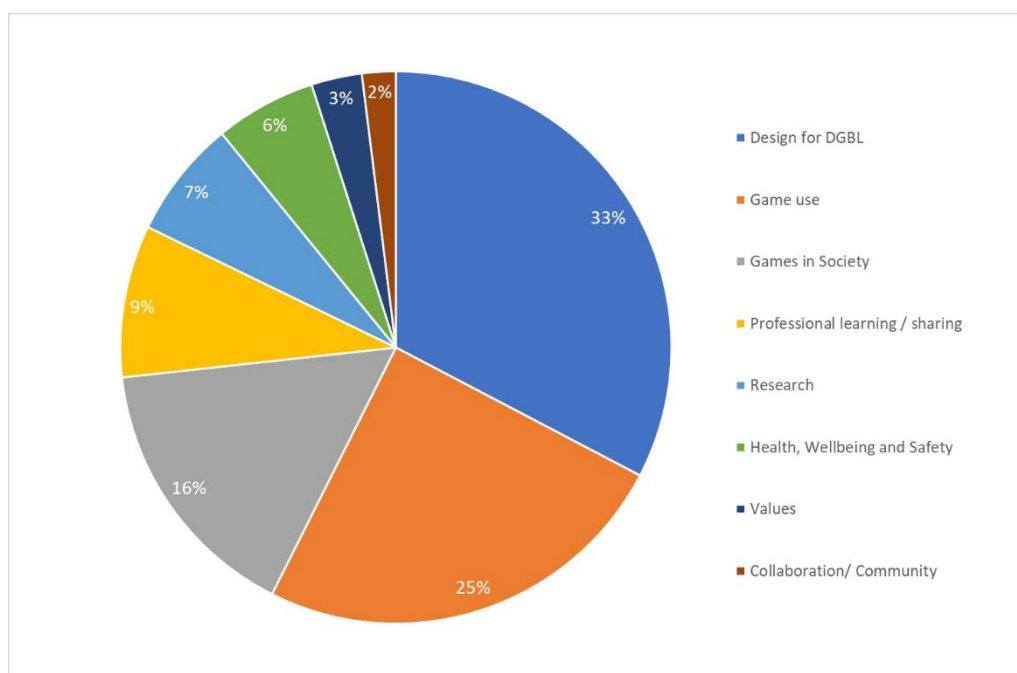


Figure 1: Distribution of topic areas in %

5.1.1 Design for DGBL

Resources that address awareness and the design of DGBL include pedagogical tips and ideas for practical implementation that teachers can adopt or redesign, including websites with lesson plans (Hey Listen Games 2021), game-based curricula (ithrive Games 2022), teacher guides (Felicia 2020) and a collection of game pedagogical ideas (Schrier 2019). Some game studios also develop lesson plans and curricula for their games (Ubisoft 2020; Epic Games 2022) or offer educational licensing and downloadable game modification ideas for educators (Positech 2016). Educational game studios typically provide curricula and lesson plan ideas for teachers combined with learning management systems to support the management and assessment of learning (Grow Planet 2020; Filament Games 2022); some provide consultancy for schools and teachers on how to build and run e-sports programs.

5.1.2 Game use

Game use resources aim to increase teachers' awareness, understanding and use of games and support teachers to identify and select relevant games in general or according to curricular goals, subjects, and age groups. These include shorter or longer curated lists of games typically combined with game trailers, written reviews, video walkthroughs, ratings, or libraries with or without search functions (Stiftung Digitale Spielkultur 2021; Common Sense n.d.) guides on game design, and game development for teachers.

5.1.3 Games in Society

Resources that raise awareness of games as cultural-historical products understand games as a way to drive societal and digital-technological transformation and promote participation in society through digital citizenship, democracy, or civic engagement (Games for Change 2022; iCivics 2022). This topic area encompasses also participation in game culture by playing, studying, designing, and developing games. For example, youth clubs

for games as a hobby, game jams for children, or video interviews to encourage students to think about games as a field of study or as a career choice in the game and e-sports industry. Online workshops and discussion forums address the importance of a participatory game design and dialog. In summary, this topic area focuses on the wider societal role of games where games are seen not only as a teaching-learning tool but as a form of youth culture, participation, and a tool for societal transformation.

5.1.4 Professional Learning and Knowledge Sharing

Resources to support teachers learning about games in education, such as video series on programming games, MOOC on game-based learning (European Schoolnet 2019), and other types of professional development courses on game-based learning, community libraries for sharing experiences, pedagogical marketplaces, or training offerings for teachers on how to address complex topics with games. The resources include structured courses and self-reported experiences shared by game-using teachers.

5.1.5 Research

Resources with a game research perspective, for example, collections of research articles on research blogs, video recordings of discussions with game researchers, informational videos, lunchtime lessons about game-based learning, game walkthroughs, expert talk shows on the pedagogical use of games in teaching (Zentrum für didaktische Computerspielforschung 2022) or researcher-developed educational games (USC Game Innovation Lab 2022).

5.1.6 Health and Wellbeing, Safety

Resources to support teachers in addressing health and wellness in gaming and safety during gameplay. Games are an important part of digital youth culture and participation in games should be a positive and fun experience for children. Resources focus on how to create a welcoming and inclusive game and youth culture online with an emphasis on inclusion, diversity, and equal treatment in games. Topics include digital wellbeing in gaming, programs, and resources for creating a healthy gameplay climate (Raising Good Gamers, no date), raising awareness about excess screen time, micro-documentaries for teachers on the effect of commercialisation in games (Länsstyrelsen Stockholm, no date), or video resources that address cyberbullying in games. These resources aim to raise awareness and provide practical tools to teachers to ensure positive gameplay experiences.

5.1.7 Values

Some of the resources openly articulate values to frame games and game-based learning. These embrace interest-driven learning, diversity, gender equality, fostering respect, social-emotional well-being, resilience, integration, etc. (NASEF 2022; Digital Schoolhouse 2020; thrive Games 2022). They are commonly expressed in mission and vision statements, core values of different stakeholders or Code of conduct rules in scholastic e-sports contexts as a way to ensure that the governing values are translated into classroom gameplay.

5.1.8 Collaboration and Community

Resources that support or promote collaboration and community around games either for teachers or their students. Topics typically include school e-sports events or tournaments where students solve live challenges in teams, for example building digital Rube Goldberg machines or competing in Minecraft problem-solving challenges such as designing solutions for tackling misinformation or building various models (NASEF 2022). Teachers can either enrol their students in tournaments or re-use the ideas and create challenges for their students in the classroom. The community aspects also refer to game studios and various organizations involving teachers in communities as part of their marketing efforts and outreach programs.

6. Discussion

In this study, we investigated how social media resources address the key literacy areas of the GLTE framework based on data from Youtube, Twitch, and Twitter. The findings suggest that DGBL resources shared on social media address the literacy areas of the GLTE framework at least partially. In Figure 2, the coloured circles indicate the topic areas that align with the GLTE framework at least in part. The white circles illustrate additional topics we could not identify in GLTE.

The most commonly shared resources address the Instructional Design literacy area in GLTE which corresponds to the *Design for DGBL* topic. These focus on the pedagogical implementation of games from ideation to planning, implementation, assessment and include Organisation and Management aspects.

The second most frequently found resources address Basic games literacy dimension in GLTE including the knowledge of, access to, and manipulation of games. Resources include ideas and selection tools for finding relevant games, supporting gameplay, or aiding game development and programming. We named this topic *Game Use* in our dataset.

High-level game literacy in GLTE is one of the key areas of games literacy development described as individual traits of teachers such as open, self-generational, and creative who continuously develop their game pedagogy. As we did not investigate personality traits, we cannot confirm this aspect of the GLTE directly. However, we identified resources that may support it. For example, *Professional Learning and Knowledge Sharing* resources such as courses or shared experiences of game-using teachers can support teachers in exploring possibilities of DGBL, improve their game pedagogy, and solve emerging challenges. *Values* can frame the kind of possibilities teachers can find in GBL and influence how they integrate games and with what purpose.

Evaluation in GLTE refers to taking critical perspectives before implementing games, carefully evaluating and critiquing games, existing empirical evidence, and observing the learning process. Evaluation is addressed in *Research, Design for DGBL* and *Knowledge Sharing* topic areas. Empirical research results and discussions on the pedagogical use of games can support teachers to evaluate the applicability of games to their teaching. The assessment of the learning process and learning outcomes are addressed in lesson plans and game-based curricula in *Design for DGBL* and by *Sharing knowledge* and experiences.

Games in Society, Health, Wellbeing and Safety, Community, and Collaboration are aspects that we could not directly identify in GLTE. These dimensions signal the need for teachers to recognize games beyond being teaching-learning tools and acknowledge them as a form of youth culture in which students participate outside of school contexts. This calls attention to games as a social practice and the need for positive game experiences in classrooms and beyond. Awareness and knowledge about the wider societal role of games can support teachers in exploring new ways of connecting teaching with student interests, classroom learning, and outside school contexts.

An explanation for the topics not covered in the GLTE framework may lie primarily in the data collection method. The GLTE framework is based on data from educational stakeholders while data in this study reflects the agendas of a wider set of stakeholders, including the game industry, for- and non-profit organizations, pan-European stakeholders as well as teachers and researchers. These stakeholders approach games and DGBL from different perspectives reflected in the resources they create and share. Teachers need to consider the applicability of the resources created by various stakeholders, the particular values, the different educational and societal contexts, and commercial interests that impact the designs of these resources.

In summary, findings suggest that game literacy for teachers needs a broader conceptualisation than the GLTE framework suggests and thus supports the argument in research that calls for the inclusion of broader societal considerations around technology use in education and an integrated view of game literacy (Bourgonjon 2014).

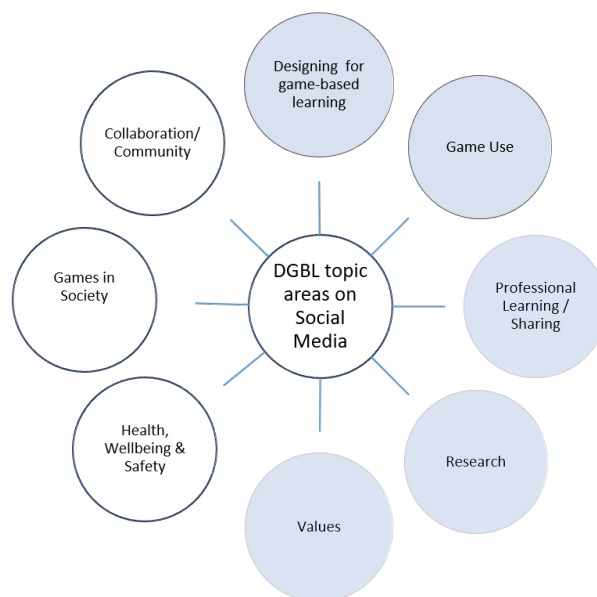


Figure 2: DGBL topic areas identified in social media resources

6.1.1 Limitations and Delimitations

Considering the time limits for the study, the search has not been fully exhaustive and offers a snapshot of resources. We checked and confirmed the validity of the data by tracing back to original publishers or sources to the extent possible within a limited timeframe. As online data may change or become unavailable, the links were checked and were still available at the time of submission. Moreover, the study did not intend to conduct an in-depth analysis. Descriptive coding is an inventory method that should be followed with a second-cycle analysis such as thematic or content analysis. The codes may not fully describe all the topics a resource addresses but rather highlight the relevant ones. Results from solo coding were validated against previous research on games and digital literacies.

6.2 Conclusion and future research

This study investigated how social media resources address the literacy areas of the Games Literacy for Teacher Education (GLTE) framework. We conclude that game literacy for teachers needs a broader conceptualisation than the GLTE framework suggests and should include the recognition of games as a form of youth culture in which students participate outside of school contexts. This calls attention to games as a social practice and the need for positive game experiences in classrooms and beyond.

The suggested dimensions reflect our dataset, and future data may require collapsing, expanding, or renaming the suggested categories. Future research could also further investigate and test the recommended dimensions or explore their use for teacher professional learning. Nevertheless, the findings indicate that conceptualisations of game literacy for teachers need to go beyond technological and pedagogical integration and consider the broader societal role of games and gaming. The resources in this study can be used as inspiration for design, critical analysis, reflection, or as practical starting points for discussions in professional development programs.

While we did not investigate the role of context in the conceptualisations of DGBL, we find indications that socio-cultural contexts play a role. For example, the competitive and community-building aspects in e-sports and digital well-being may be emphasized in some contexts. In other settings, games might be approached from the cultural-historical perspective. Yet, in another context, constructionist approaches to game-based learning, such as programming and game development, may become more pronounced. Hence, future research could investigate how social-cultural contexts influence the role of DGBL in education.

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