Exploring the Characteristics of Instructional Design Professional Knowledge from a Facebook Community of Practice (CoP)

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Abstract

Online communities of practice (CoPs) in Instructional Design play an important role in creating and transferring professional knowledge (tacit knowledge). This study examines the characteristics of professional knowledge from 4,717 anonymized users' posts available in the Instructional Designer Facebook group from August 3rd, 2017 to September 9th, 2020. This group is the largest public group on Facebook with 17,640 members as of September 29th, 2021 (About Us CrowdTangle, n.d.). Natural language processing approaches, including n-grams, sentiment analysis, visualization of named entities, and topic modeling, were implemented to extract tacit knowledge from written forms of communication. Three topic models, including bag-of-words, TF-IDF, and sentence embeddings, showed topics related to corporate training, online training, authoring e-learning tools, resource downloads, virtual reality, mobile learning, and outsourcing e-learning development. In the visualization of relationships between named entities, this particular CoP is characterized by (1) the recognition of members' contribution and request for feedback, (2) the use of hashtags related to e-learning development and trends, and (3) the request for career advice related to the Instructional Design profession. The study has implications for developing practitioners' pedagogical proficiencies and establishing community knowledge management and curation practices.

Keywords: Communities of Practice, Natural Language Processing, Social Media

Introduction

Tacit knowledge, or tacit knowing, was initially coined by Polanyi (1983) to describe the type of knowledge that is difficult to transfer to another person. Lave and Wenger (1991) stated that CoPs are characterized by a shared domain of interest, joint community activities, and a shared domain of practice. While present studies examine Instructional Designers' professional development needs and roles in academic and corporate settings using observation and survey methods, studies examining sources of articulated professional knowledge (explicit knowledge) in a virtual environment are required to understand current knowledge structures and gaps in Instructional Design communities. In the knowledge management literature, empirical studies in tacit knowledge extraction use n-grams and topic modeling algorithms to capture semantic relationships from explicit knowledge. The study uses natural language processing approaches, including topic modeling techniques to make topic representations and word sequences from users' posts.

Literature Review

The following literature review identifies the ways technology supports online communities of practice, the collaborative context using information and communication technologies (ICT), and the characteristics of Instructional Design communities.

Technology to Support Communities of Practice

With the advent of more collaborative ICT in Web 2.0, members in a CoP can co-produce, organize, discover, and share knowledge within a collaborative online context. Using ICT to support knowledge production and collaboration, CoPs have become increasingly virtual or Internet-mediated communities of practice. Rheingold (2000) initially coined the term virtual community to emphasize the evolution of ICT technologies and human-computer interactions that connect individuals with organizational structures. Online communities are defined as "online social networks in which people, with common interests, goals, or practices, interact to share information and knowledge, and engage in social interactions" (Chiu et al., 2006, p. 1873).

Akoumianaki (2011) argued that technologies must support virtual communities of practice regarding functional and non-functional requirements. Functional requirements are the critical pieces of technology that support members' participation and engagement. In contrast, non-functional requirements refer to the supporting technological mechanisms that enable participants to facilitate and refine their knowledge exchange. According to Heap and Kelly (2004), technical means must support the core function of knowledge creation and sharing of online communities regarding functionality, integration, usability, security, performance, reusability, and support. When these mechanisms are present in online communities, ICT tools support members in four ways; (1) ideation, information and document sharing, (2) contact management, (3) messaging and discussion, and (4) meeting and conferencing (Heap & Kelly, 2004).

As knowledge consumers, Nilan et al. (2004) stated that users in online communities try to make sense of information within a specific search context. The design of online communities can either facilitate or hinder users' movement within the community. In their findings, Nilan et al. (2004) found that members spent most of their time searching and reading within the community. Examples of searching within the community included scanning for topics or news topics, checking out other users, selecting or clicking on options, and reading within the community (e.g., reading existing content, announcements, and responding to others). The authors also reported the hindrances that users faced in virtual communities. Poorly designed interfaces hindered users' iterative searching, reading, and writing/talking within communities.

Instructional Design and E-Learning CoPs and Competencies

Schwier et al. (2004) argued that Instructional Design CoPs are born of convenience that allows informal engagement to solve specific project challenges or issues. The authors also investigated the features of Instructional Design CoPs in terms of history and culture, mutuality, plurality, knowledge repository, and tacit knowledge. They found that shared history and culture were not prominent features in Instructional Design CoPs. In contrast, passive participation as a

spectator was a critical element aligned with practitioners' agendas and community values. In terms of mutuality, community members developed their protocols for contribution and interaction with others. At the same time, community participation was based on the plurality of the intermediate relationships with other members (i.e., experts in the field) that provided a wide range of considerations and solutions to learning problems.

Due to the absence of a recognized accrediting body that identifies the required competencies for Instructional Design and Technology professionals, professional organizations have developed the competencies that define the knowledge, skills, and abilities of professionals in the field. Though several professional organizations developed their competencies, three prominent professional organizations use competencies to encapsulate the professional benchmarks, responsibilities, and capabilities of these professionals serving in different roles (e.g., Training Manager, Evaluator, Instructional Designer, and Instructional Technologist). These organizations are the American Talent Development (ATD), the International Board of Standards for Training, Performance, and Instruction (ibstpi), and the Association for Educational Communications and Technology (AECT).

Problem Statement

The characteristics of professional knowledge creation among Instructional Design CoPs in virtual environments are primarily unknown in the instructional design and technology literature. While present studies examine Instructional Designers' professional development needs and roles in academic and corporate settings, exploring sources of professional knowledge in virtual environments is required to understand the current knowledge structures and gaps in Instructional Design professional knowledge. Professional knowledge (tacit knowledge) is conveyed and shared in explicit or written form for and by community members.

Purpose & Significance of the Study

The purpose of the study is to extract tacit knowledge at the externalization stage (i.e., articulated professional knowledge) from users' written professional knowledge who are members of the Instructional Designer Facebook group. In the externalization stage articulated in the SECI model by Nonaka and Takeuchi (1995), explicit and tacit knowledge is generated, transferred, and recreated in organizations through socialization, externalization, combination, and internalization processes. The study explores the following research questions:

- **RQ 1**: What are the most frequent words and word sequences used in the CoP?
- **RQ 2**: What are the characteristics of sentiment, named entities, and relationships among entities in the CoP?
- **RQ 3**: What latent topic structures exist in the CoP?

The significance of this study involves a community's ability to manage their existing body of knowledge and leverage members' collaboration to generate new professional knowledge. CoPs act as knowledge stewarding communities where members can organize and manage a body of knowledge from which the community can draw professional learning to improve their practice. CoPs also act as a crowdsourcing mechanism where community members

can generate professional knowledge by converting tacit knowledge, or know-how experiences in the field, into explicit forms (e.g., written texts, videos).

Theoretical Framework

Research studies in the knowledge management literature examine tacit knowledge extraction from explicit forms of knowledge in the workplace (e.g., online platforms, documents, and e-mail communication). These studies are explored through the SECI model, where knowledge is continuously created through socialization, externalization, combination, and internalization phases (Nonaka & Takeuchi, 1995). First, tacit knowledge is created through a socialization process, and its tacitness is difficult to codify into explicit knowledge. Second, tacit knowledge is externalized or articulated in symbolic language for sharing with other groups or individuals. Third, the combination step requires applying and reorganizing explicit knowledge. Fourth, when explicit knowledge is applied, individuals embody the knowledge as tacit through action and reflection.

Methods

The Instructional Designer Facebook group was chosen as a data source for this study. This public Facebook group was founded in 2011 by the E-learning Industry website. According to CrowdTangle Intelligence, a public insights tool from Facebook, the Instructional Designer group is the largest public group on Facebook with 17,640 members as of September 29th, 2021 (About Us CrowdTangle, n.d.; Instructional Designer, n.d.). Any Facebook user can request access to this group by answering a filter question related to their reason for joining the group.

A total of 6,760 anonymized users' posts from August 3rd, 2017 to September 9th, 2020 were extracted with Python scripts. After cleaning Facebook posts that contained "hi," "hi there," "hello all," and "good morning professionals," the dataset was reduced to 4,717 posts. Then a sentiment analysis was performed using the Textblob Python package. (*TextBlob: Simplified Text Processing — TextBlob 0.16.0 Documentation*, n.d.). Posts were also analyzed with a variety of natural language processing tasks, including (1) n-grams with NLTK, (2) Name Entity Recognition (NER) with the spaCy Python package, and (3) topic modeling using the Latent Dirichlet Allocation algorithm (LDA) and BERT (Bidirectional Encoder Representations from Transformers) (*Linguistic Features · SpaCy Usage Documentation*, n.d.; *Natural Language Toolkit — NLTK 3.5 Documentation*, n.d.; *Open Sourcing BERT: State-of-the-Art Pre-Training for Natural Language Processing*, n.d; *NetworkX — NetworkX Documentation*, 2014). N-grams are a sequence of words that predict the probability of the occurrence of words in the corpus. NER is a natural language processing task that locates named entities in texts into eight predefined categories or tags, including geographical entity, organization, product, person, time indicator, artifact, event, and natural phenomenon.

The known limitation involved the removal of external resources placed in Facebook posts, including shared resource documents, recommended articles, and video links. While the tacit knowledge representations of these communities are static for a given period, topic models will continue to evolve as members engage in knowledge creation and sharing in their respective communities.

Findings

After cleaning Facebook posts from 6,760 to 4,717, the study results are summarized below by research question.

RQ 1: What are the most frequent words and word sequences used in the CoP?

The average word count was 38.75 words, whereas the average sentence count was 3.14 sentences in the Instructional Design Facebook Group. In Figure 1, the most frequent words included “anyone,” “id,” “course,” and “looking.” In terms of n-grams, the top three most frequently occurring bigrams were “instructional, designer,” “instructional, design,” “hi, everyone,” and “im, looking.” The top three most frequently occurring trigrams were “elearning, elearningtrends, elearningdevelopment,” “hi, everyone, im,” “instructional, design, technology,” “thanks, advance, hi,” and “would, love, hear.” As shown in Figure 2, the most frequent 4-grams were “follow, u, learningpark, learn,” “elearning, elearningtrends, elearningdevelopment, lm,” and “learnandgrow, learnfromhome, learner, learningeveryday.”

Figure 1

Instructional Designer Facebook Group Word Frequencies

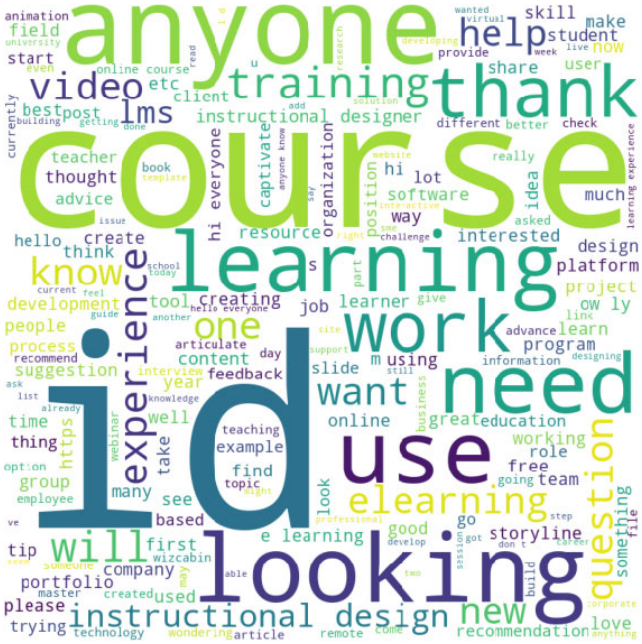
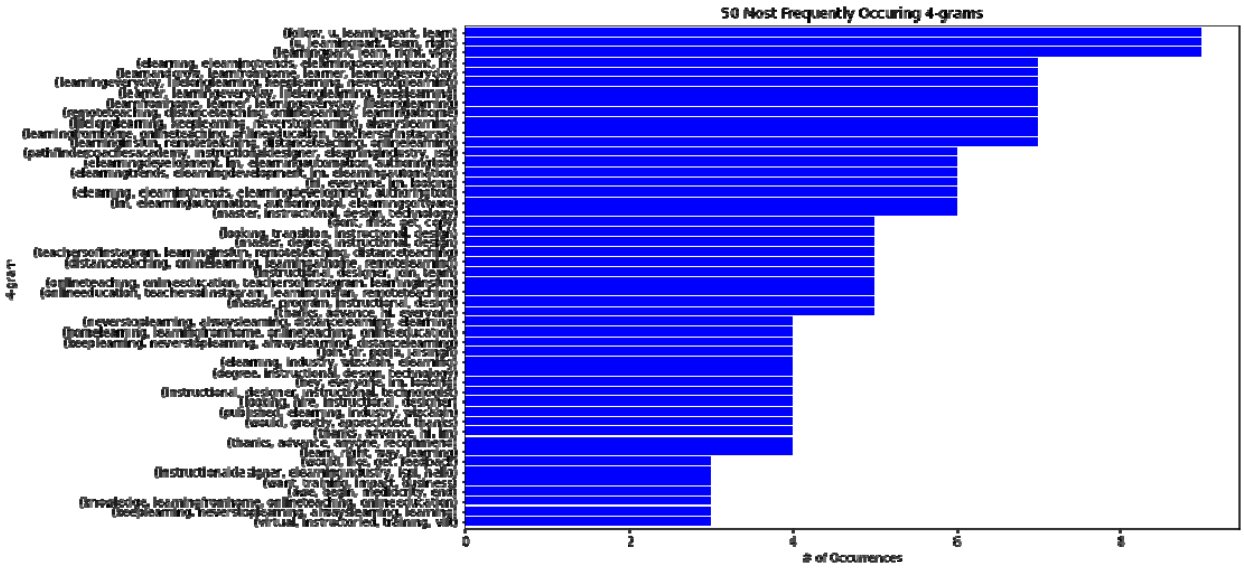


Figure 2

50 Most Frequently Occurring 4-Grams

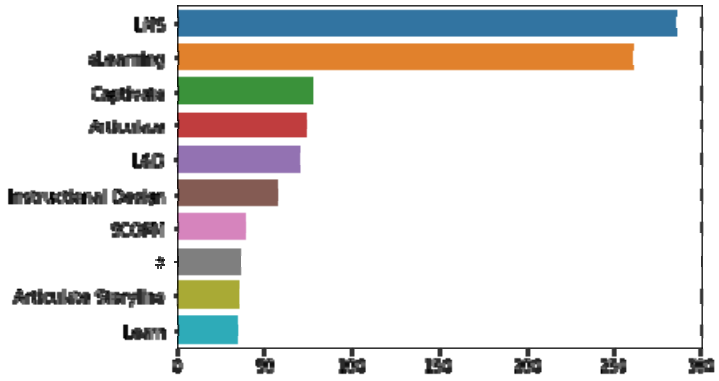


RQ 2: What are the characteristics of sentiment, named entities, and relationships among entities in the CoP?

The sentiment analysis indicated that most posts (3,298) had a positive sentiment, whereas other posts were either neutral (1,011) or negative (408) sentiment. In terms of recognized named entities, most entities were related to the organization entity. In Figure 3, most organizational entities were related to LMS, elearning, Captivate, and Articulate. The limitation of NER involved the lack of differentiation between entity types related to organization, product, person, and country or nationality entities. For example, NER assigned person and nationality entities to web conferencing tools, authoring software, and learning management systems. In terms of product entities, shared resources (e.g., e-books) were also recognized in the community. The entity relationships with the highest degree included "educational, animation," "instructional designer, e-learning industry," "responsive e-learning design, multidevice," and "just for fun, effective learners."

Figure 3

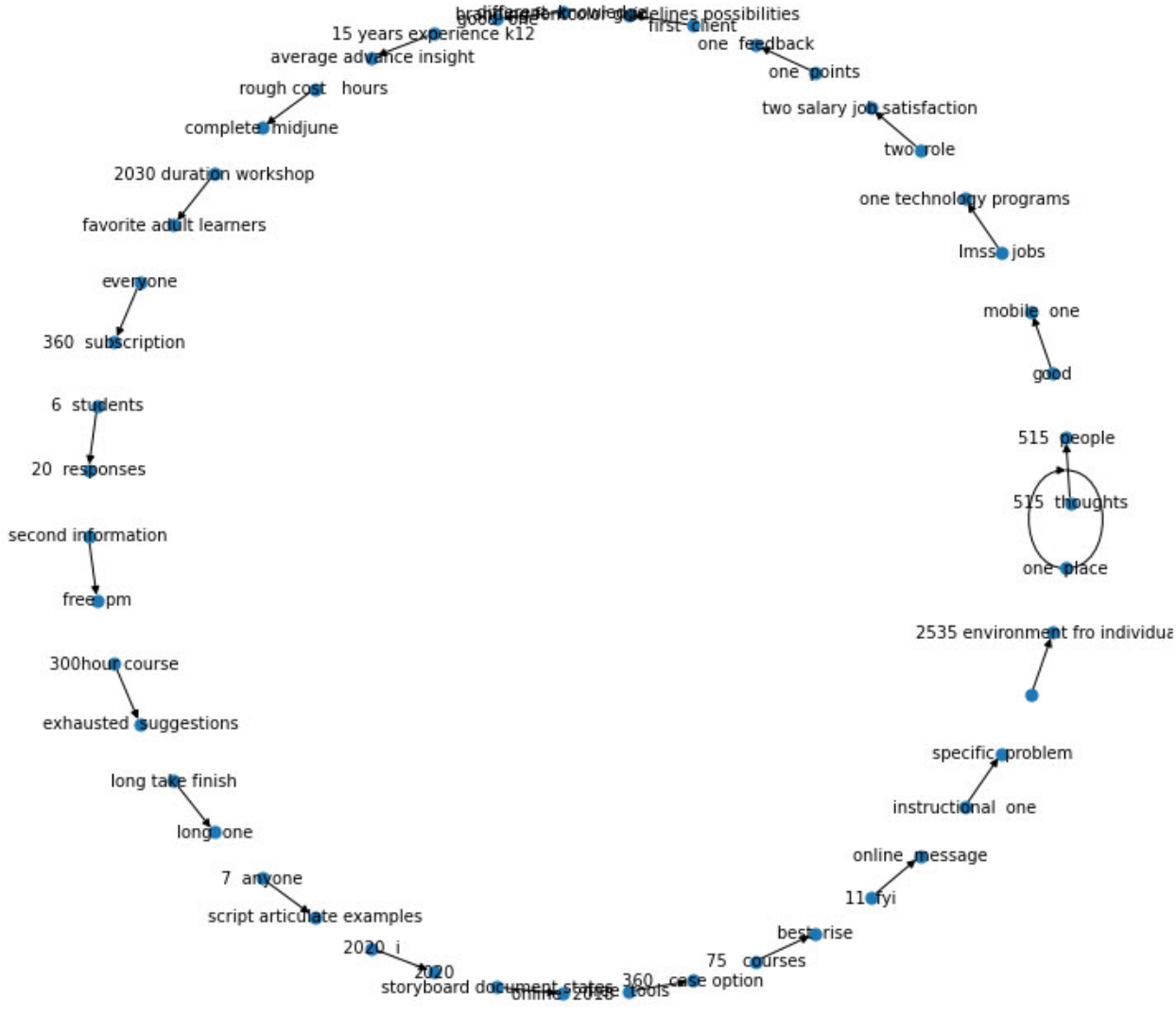
Most Frequently Recognized Entity Types



The most popular entities included “one” and “today,” whereas the most popular target entities had “good one” and “https.” The most popular relationships among entities were “thanks,” “thank” and “want.” When visualizing “thanks” as a popular relationship, as shown in Figure 4, members in this CoP appeared to engage with each other’s requests related to various topics, including resource sharing, Instructional Design graduate programs, and e-learning authoring software and hardware.

Figure 4

Most Popular Relationships for “Thanks” Entity



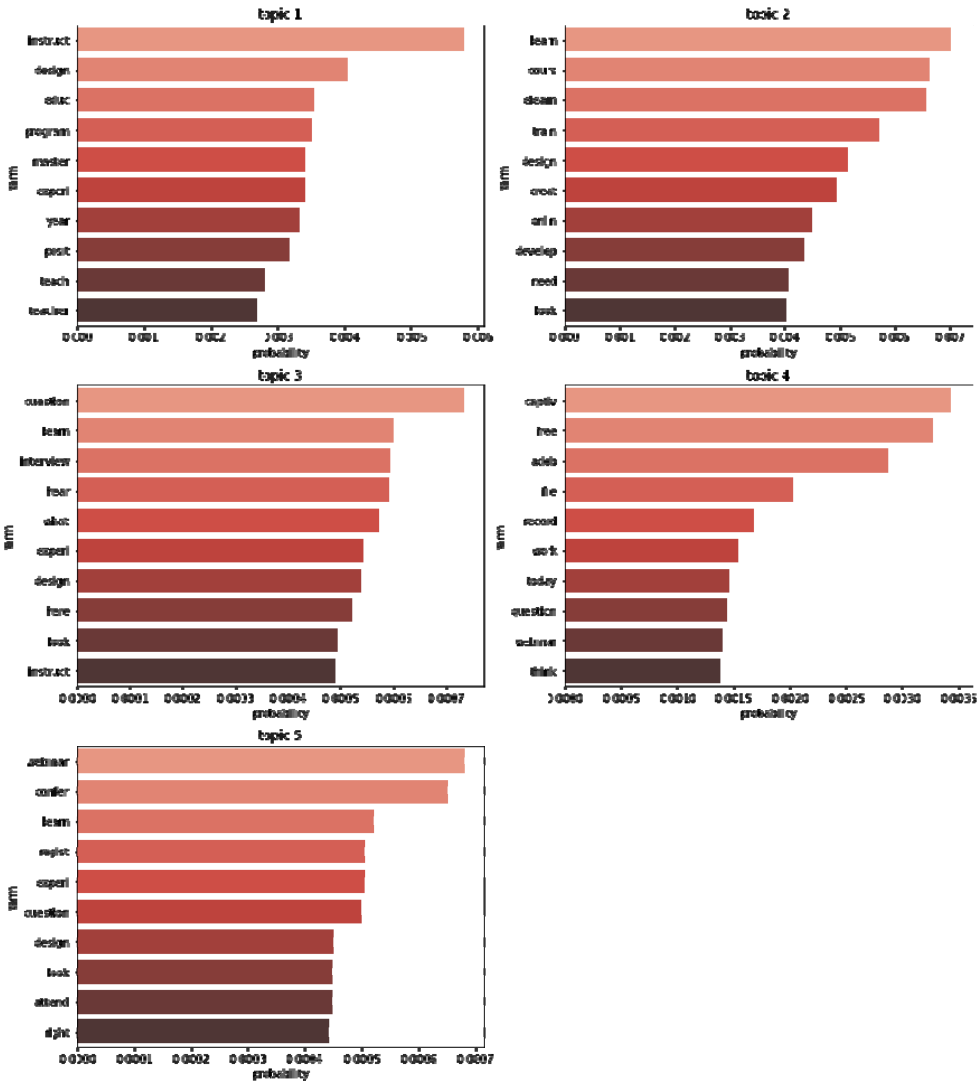
RQ 3: What latent topic structures exist in the CoP?

The bag-of-words, TF-IDF, and sentence embeddings topic models were developed to identify latent topics from the Facebook group. After obtaining the highest semantic coherence of 0.48 using five topics for the LDA algorithm topic parameter, as shown in Figure 5, the five topics in the bag-of-words and TF-IDF models had a similar distribution of topics related to:

1. Instructional Design job postings
2. Learner or student online training
3. Asking for advice related to e-learning authoring tools
4. Online course and video development
5. Sharing of webinar events

Figure 5

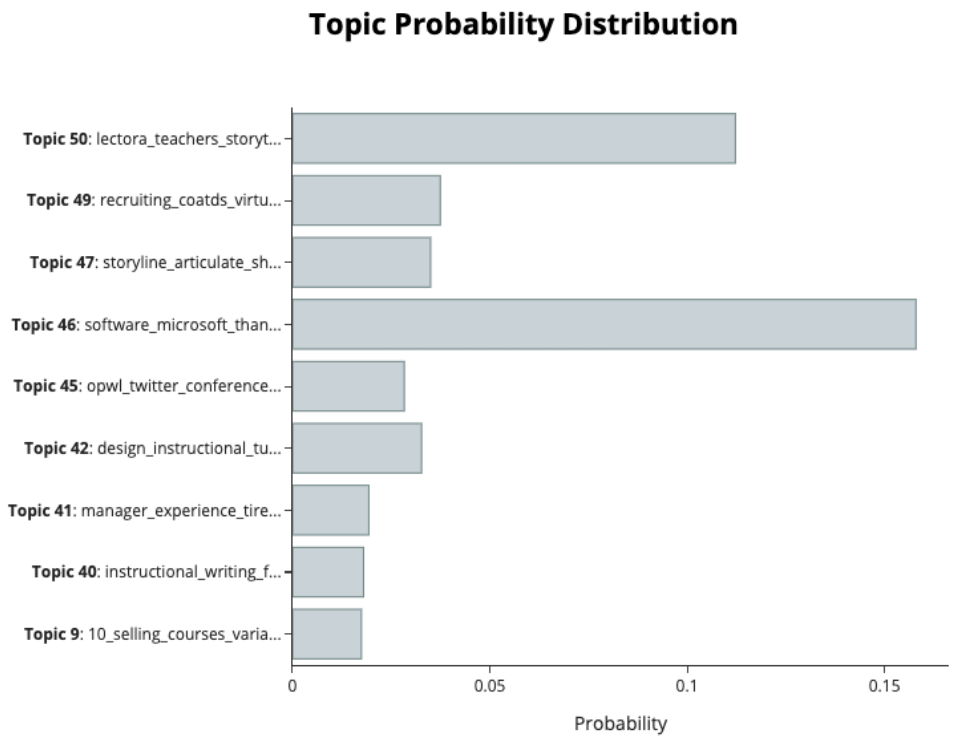
TF-IDF Model Topic Distribution



In the last model using sentence embeddings with BERT, the model automatically performed a dimensionality reduction and clustering of texts. Based on the intertopic distance map, the 74 topics were present in nine clusters. In Figure 6, the nine topics with the highest probability were as follows: (1) Microsoft products, (2) lectora and storyline e-learning authoring, (3) virtual recruiting, (4) story articulate, (5) conferences, (6) Instructional Design, (7) managerial/trainer jobs, (8) instructional writing, and (9) selling online courses.

Figure 6

BERT Topic Probability Distribution



Discussion

In the analysis of 4,717 users' posts from the Instructional Designer Facebook group, the average sentence word count was 38.75 words, and the average sentence count was 3.14 sentences. In terms of sentiment, 3,298 posts were positive, 1,011 posts were neutral, and 408 posts were negative. Words with the most frequency included: "id," "course," "learning," "anyone," and "looking." The most frequent 4-grams were "follow, u, learningpark, learn," "elearning, elearningtrends, elearningdevelopment, lm," and "learnandgrow, learnfromhome, learner, learningeveryday." The entity relationships with the highest degree included "educational, animation," "instructional designer, e-learning industry," "responsive e-learning design, multidevice," and "just for fun, effective learners."

In this particular CoP, there was an emphasis on learning management systems that support various tasks, including task management, employee onboarding, and compliance

training. Based on the observed n-gram sequences and entities, the Facebook group posts appeared to suggest three aspects of knowledge sharing among members:

1. Recognizing members' contributions and requests for feedback through informal salutations and following certain users and posts
2. Using hashtags related to e-learning development and trends for resharing and following
3. Requesting career advice related to transitioning to the Instructional Design field

Although topic representations in the bag-of-words and TF-IDF topic models were almost identical using the LDA algorithm, LDA relied on semantic similarities based on words rather than the context of the words. To compensate for the shortcomings of LDA, BERT allowed for discovering subtopics and topic outliers based on the context of the surrounding words. In the BERT topic model, nine topics were prominent in the Facebook group, including (1) Microsoft products, (2) lectora and storyline e-learning authoring, (3) virtual recruiting, (4) story articulate, (5) conferences, (6) Instructional Design, (7) managerial/trainer jobs, (8) instructional writing, and (9) selling online courses.

Implications & Future Research

The empirical evidence of tacit knowledge structures informs researchers and practitioners about the present capabilities and strengths of CoPs in producing and sharing knowledge in certain areas of Instructional Design expertise. Other research can build on new ways of creating and supporting new tacit knowledge production in virtual CoPs by experimenting with content curation practices, knowledge discovery mechanisms, repository tools, and social knowledge representation methods described by Cagliero and Fiori (2012) (e.g., subject-based classification, folksonomy, and structured knowledge). It is recommended that Instructional Design CoPs adopt a taxonomy or classification system based on professional competencies to organize existing professional knowledge and improve knowledge discovery within the community. Even though the primary function of this CoP is to support educational technology needs, building pedagogical proficiencies in Learning Sciences, Instructional Design, and Knowledge Management is also essential for practitioners' professional development.

Conclusion

The resulting study contributes to understanding the knowledge production capabilities and shared practices in Instructional Design CoPs. After analyzing 4,717 anonymized posts from a public Facebook group in Instructional Design, popular word frequencies and n-grams were related to asking peers and looking for solutions. While named entities were related to learning management systems and e-learning tools, the network visualization of these entities showed active engagement in seeking advice related to resources, Instructional Design graduate programs, and software tools.

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