



Actor-Network Theory and Digital Literacy Practices:
An Analysis on the “Actant-Pedagogy” for Composition Classrooms

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Abstract: Scholarship in actor-network theory (ANT) has been propelled into the limelight among composition scholars. Recent literature in composition studies has lauded ANT as not only a theoretical move but pedagogical tool in writing classes. Although recent compositionists have theorized how to incorporate the discussion of ANT into rhetoric and composition through promoting an “actant-pedagogy”, there is a scanty amount of empirical research examining the use of ANT to benefit digital literacy practices. Following and expanding the practices of ANT in education, this article aims to argue for a look at empirical studies in adult education and examine how the knowledge of these studies may provide implications to enrich the “actant-pedagogy” for composition studies.

Keywords: actor-network theory, digital literacy, adult learners, composition studies

Introduction

Actor-network theory (ANT) has its root in the sociology of science and technology dating back to the 1980s. Nevertheless, the term of ANT is not very familiar in composition studies. Only in recent years has ANT been touched upon by composition scholars in their discussions on ecological writing (Cooper, 2015; DeVoss, McKee, and

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Selfe, 2009), writing materiality (Gries, 2012, 2013; Holmes, 2014; Jordan, 2015), and digital composition (Fraiberg, 2010; Rice, 2013). Some of these scholars further argue for utilizing an ANT-related pedagogy, or what Holmes (2015) calls the “actant-pedagogy” in composition classrooms (Cooper, 2015; Holmes, 2014; Rice, 2013). The “actant-pedagogy,” while serving as an ontological shift in composition, has not fully taken into account the digital dimensions of literacy practices. Additionally, few empirical studies have been conducted to examine the application of the “actant-pedagogy” in the teaching of writing.

In comparison, existing literatures over the past five years demonstrate that use of ANT has gained currency in educational research on digital literacy practices. Scholars in education have begun to look into the application of ANT in digital literacy practices for adult learners (Bhatt, 2012; Bhatt & DeRoock, 2013; Gourlay, 2015; Lea & Jones, 2011; Knox & Bayne, 2013; Thompson, 2014). Findings of these studies suggest that researchers pay attention to the network of human beings and material elements that have shaped learners’ digital experience. The studies also open the door to a more systematic account of the “actant-pedagogy” through exploring interrelated concepts of ANT, i.e., translation, network assemblages, and symmetry. Thus, these insights from educational research may potentially enrich the “actant-pedagogy” in composition.

In this light, this essay aims to 1) address the gap between ANT and digital literacy in composition studies through examining ANT-related educational research, and to 2) call for more empirical studies to explore the pedagogical implications of ANT in composition classrooms. The arguments of this essay will proceed in four parts. First, the essay provides a theoretical framework on digital literacy practices and ANT. Specifically, I focus on how ANT moves beyond the view of digital literacy as a social practice to incorporate the material aspects of learning such as technological tools. Secondly, it traces compositionists’ interests in ANT through their discussions on the “actant-pedagogy.” This pedagogical approach highlights a theoretical move from “explanation” to “description.” After that, the essay examines ANT-related educational studies and their pedagogical implications for composition. Specifically, an analysis of translation, network assemblages, and symmetry will be provided to complicate the focus on “description” in actant-pedagogy. Finally, it offers some general thoughts on how the “actant-pedagogy” serves to inform future scholarship in digital literacy and composition studies.

Theoretical Framework

Digital Literacy Practices

Theories revolving around digital literacy have not focused on one group of thought and scholars of digital literacy studies have not reached a consensus on what tenets to

follow (Gee, 2010). Given the diversity of different research agendas, digital literacy can generally be conceptualized as stemming from the “social turn” in literacy studies, particularly from the new literacy studies (NLS).

The concept of “digital literacy” is closely related to the view of literacy as a social practice by NLS. NLS scholars have challenged the “autonomous model of literacy” that renders a decontextualized account of writing reducing literacy to the acquisition and mastery of a set of technical skills. In contrast, NLS pushes literacy studies forward to espouse an “ideological model of literacy”, which posits that literacy should be understood as a practice that is socially constructed and embedded in social contexts (Street, 2003). NLS therefore orients towards understanding literacy as a social practice. Moreover, the movement of NLS highlights the theorization of digital literacy as socially constructed. Digital literacy can be seen as the use of multiple semiotic resources beyond the written texts, co-creating “integrated meaning-making systems of electronic multimedia texts” (New London Group, 1996, p. 83) and generating different effects under diverse social and historical contexts (Gee, 2010). In other words, the meaning-making process of digital texts arises from sociocultural and historical factors in digital literacy practices. In this sense, NLS also conceptualizes digital literacy as socially and culturally constructed.

Actor-Network Theory

Similar to digital literacy, ANT does not lead to a single theoretical framework but rather a constellation of ideas. The theoretical framework of ANT has been established, expanded, and reexamined by social scientists and sociologists (Callon, 1986; Latour, 1999, 2005; Law, 1999). As part of the socio-material movement, ANT debunks the dichotomy between the social and the natural, the cultural and the material through a close examination into material things or non-human actors (Fenwick & Edwards, 2010). The underlying assumption of ANT is that social communicative actions “involve both people and technologies, and that the material features of a technology are developed and used in a system of social relationships” (Contractor, Monge, & Leonardi, 2011, p. 684). That is to say, ANT resists a predefined distinction between human systems and material entities. Integral to the idea of ANT are three interconnected notions, i.e., “translation”, or how things change each other to form connections; “network assemblage”, or how things are held together in networks; and “symmetry”, or how things exert equal forces as human beings do (Fenwick & Edwards, 2010). These three notions are interconnected with each other in the formulation and variation of actor networks.

ANT opens a new avenue to understanding knowledge production and acquisition. Originated in the philosophy of Gilles Deleuze, relations and connectivity from ANT’s perspective generate lines of becoming and potentials for action (Ingold,

2011). Rather than delineating knowledge construction within fixed and certain boundaries, or what Fenwick and Edwards (2014) refer to as the “black box”, ANT offers a new theoretical lens to perceive knowledge production as undergoing network assemblages and re-assemblages, and dynamic translations and negotiations among networked entities. Furthermore, the concept of “symmetry” moves knowledge construction towards “more than the human” (Fenwick & Edwards, 2014; Gourlay, 2012). Through asserting that there is nothing outside of the networked relations and that agency is considered as distributed among human beings and material things, ANT assigns equal power to people and the objects with which they interact (Contractor, Monge, & Leonardi, 2011; Müller, 2015; Ingold, 2011). Thus, ANT is an ontology that foregrounds transformation, fluidity, and practice.

The notions of translation, network assemblages, and symmetry are actualized through the enactment of “actancy” (See Latour, 1999, 2005). ANT holds that action is “simply not a property of humans but of an association of actants, and that is the second meaning of technical mediation” (Latour, 1999, p. 182). That is to say, human beings are not the only entities that exert influences on their actions. Rather, the actions are mediated by the interconnected effects of “actants”, namely the hybrid actors composed of both human beings and non-human entities. The conceptualization of material artifacts, especially non-human actors as “mediators” taps into the transformative nature of material objects that can translate other actors in the network assemblages of learning. Thus, language learning is not so much the effect of an individual act as that of a networked practice.

Therefore, ANT, not unlike NLS, constitutes part of the shift to a social interpretation of language learning; nevertheless, ANT also serves as an expansion to the uptake of digital literacy as a “social practice” (New London Group, 1996; Street, 2003). First, ANT moves beyond privileging human intentionality and agency towards highlighting the networks of human and non-human actancy. ANT calls into question “whether the theorizations of the sociocultural in practice theories give due weight to the significance which material artefacts bear in the social world” (Baynham & Prinsloo, 2009, p. 10). In other words, by challenging the asymmetrical account of human beings and non-human materials, ANT provides an alternative to human agency and centralization celebrated by NLS. For instance, NLS conceptualizes learners as “designers” (New London Group, 1996), who consciously initiate changes in the meaning-making processes. ANT thus offers a critique on NLS as NLS fails to delve into the material aspects of digital literacy practices that are of equal importance as human agents. Additionally, ANT also challenges NLS for its reliance on “predefined categories” to detect macro-level social systems through examining local interactions. For ANT there is no a priori distinction between the local and the global, as John Law puts it, “the local is all that there is” (as cited in Clarke, 2002, p. 111). Instead, ANT defies the generalizations of macro-level social systems and describes the micro-movements of

human and non-human entities in society (Clarke, 2002). With the discussion of material actancy and local enactment in mind, the next section will look into compositionists' interests in ANT and ANT-related pedagogy.

Actor-Network Theory in Composition Studies

The recognition of ANT in composition studies is most pronounced in different areas of composition studies, including research on ecological writing (Cooper, 2015; DeVoss, McKee, and Selfe, 2009), writing materiality (Gries, 2012, 2013; Holmes, 2014; Jordan, 2015), and digital composition (Fraiberg, 2010; Rice, 2013). One of the key pedagogical orientations of ANT in composition research is manifested in the promotion of what Holmes (2015) refers to as the “actant-pedagogy” that enhances the composition practices of adult learners. The following review will examine the conceptualization of actancy in different domains of composition studies, with special attention paid to the implications of the “actant pedagogy.”

Scholars in ecological writing studies have envisioned actancy as embedded in the interaction between interlocking systems and ecologies of learning. This can be exemplified by the growth of research interests in digital and technological ecologies, such as Danielle N. DeVoss, Heidi A. McKee, and Richard Selfe's edited book *Technological Ecologies and Sustainability*. Based on Latour's ANT, it has been pointed out that a complex ecology emerges out of the interaction between computerized writing artifacts and human beings utilizing and supporting the technologies (DeVoss, McKee, & Selfe, 2009). Considering multimodal computerized composition as analogous to ecological systems in which human beings and the material technologies formulate a network of interaction, the researchers philosophize the sustainable practices in which both human and technological actors function as actants in composition programs and classrooms. The assemblage of technology including teaching and learning artifact in the digital ecology constitutes a dynamic movement in which actors interact with each other. Therefore, actancy co-creates the networks in the ecology of writing.

Recently scholars in rhetoric and materiality have also utilized the notion of actancy to philosophize the material aspects of composition. For instance, scholars such as Laurie E. Gries and Jay Jordan have incorporated the discussion of actants in their theoretical frameworks. Gries (2012) adopts Latour's notion of actancy to put forward a materialistic interpretation of images and their circulation. She maintains that the actant, or the hybrid actor “reminds us that it is nonsensical to claim one actor has willpower over the other and that action can be attributed to one (typically human) actor” (Gries, 2012, p. 81). In other words, this concept of actancy has debunked human-centered view of agency and valorized other actions performed by non-human agents. Similarly, Jordan (2015) also draws from Latour's notion of ANT when exploring actancy in translingualism. He notes that agency is co-created by actants through configuring

humans as resources rather than humans as users (Jordan, 2015). The ontology of actancy thus provides the conceptual framework for Jordan to call for a shift to a materialistic understanding of translingual composition. Through this lens, for Gries as well as for Jordan, agency is not predefined and predetermined, but rather co-constructed by different resources in materiality, including human and non-human actants.

In this sense, the potential benefits of ANT in the studies of digital composition, lies in its ability to provide new pedagogical tools for writing using a myriad of material and technological actants. Some composition scholars recently have touched on enriching existing writing approaches by way of implementing an ANT-related pedagogy, or “actant-pedagogy” in writing classrooms and composing practices. These researchers include Marilyn Cooper, Steven Holmes, and Jeff Rice. One of the fundamental implications of the “actant-pedagogy” is its focus on “description” over “explanation.”

“Actant-pedagogy” has been proposed by Steven Holmes to move beyond the “social-epistemic pedagogy” promoted by James Berlin. Holmes (2014) maintains that Latour’s ANT stands in sharp contrast to Berlin’s social-epistemic rhetoric, as the social-epistemic pedagogy speaks to Cartesian dualism between mind and body, contending that agency exists outside the material objects and is driven by human consciousness. Holmes, in contrast, is in support of the “actant-pedagogy” that debunks Berlin’s asymmetrical account of human and non-human actors through emphasizing the interaction between different actors.

At the same time, however, composition researchers have pinpointed the challenge utilizing ANT in composition classrooms and promoted an interpretive tool of “description” to combat such a challenge. A distinction has been made between “explanation” and “description” that warns against using an ontology of “explanation” during the implementation of the “actant pedagogy.” Latour has drawn an analogy between explanation and drawing the shape of a pencil, and between description and the object of pencil to draw with (As cited in Holmes, 2014). Just as Latour (2005) writes, “ANT is more like the name of a pencil or a brush than the name of a specific shape to be drawn or painted” (p. 143). In other words, ANT seeks to focus more on inductively describing the actors in a learning site rather than deductively explaining how the actors function. However, the bulk of the existing pedagogical approaches in composition aim to explain writing as an interpretive tool to the students as opposed to engineering students’ ability to develop their own descriptive tool of composition (Holmes, 2014). Therefore, there is a gap between mainstream writing pedagogies and the “actant-pedagogy” derived from ANT.

To address this challenge, compositionists have employed “description” in writing classrooms. Specifically, Holmes, Cooper, and Rice have elaborated on their use of actant-pedagogy in writing instruction. For example, Holmes (2014) encourages

students in his writing class to brainstorm questions related to taxes on soda and capture a myriad of actors contributing to the idea of soda taxes such as beverage associations, manufacturing sites, and health consequences. In this sense, instead of explaining the meanings behind these actors, Holmes allows students to draw connections between different actors. Cooper (2015) also holds that knowledge is constructed through a description of events. She illustrates how a student writer draws upon various actors to investigate the Keystone pipeline permit, including news report, interview protocols, and document collections. Additionally, Rice (2011) has utilized “description” in theorizing networked assessment since the traditional assessments of writing run the risk of overemphasizing the “values” that one hopes to promote. For Rice, composition studies can thus benefit from an account-based assessment that traces a network of actors such as class size, student and faculty perception, and out-of-class writing. Therefore, the movement from “explanation” to “description” lies at the heart of the actant-pedagogy in composition studies.

As mentioned above, compositionists have elaborated on the adoption of the “actant-pedagogy” in writing practices; nevertheless, adopting the concepts of ANT to enhance literacy learning and composition pedagogy in the digital world has not been explored exhaustively by composition scholars. Fraiberg (2010) draws upon ANT to illustrate the bridging of boundaries between human beings and material objects, expanding the existing frameworks in digital and multimodal composition. As mentioned by him, “This move expands our notion of conversation; human actors are no longer in dialogue only with one another, but also with other texts and tools” (Fraiberg, 2010, pp. 106-107). Through this lens, teachers and students also are involved in conversations with material objects and learning tools, such as books, websites, and assignments. While celebrating the use of ANT in multilingual and multimodal composition, Fraiberg has not elaborated on the pedagogical implications on implementing ANT in digital practices. Therefore, there is a lack of exploration into the pedagogical implications shedding light on the use of ANT in digital composition. With the ontology of “description” in mind, the next section will focus on how educational research in digital literacies and ANT complicates the concept of “description” in composition studies.

Actor-Network Theory in Educational Research

Although recent scholars have theorized how to incorporate the discussion of ANT into rhetoric and composition, there is a scanty amount of literature examining the use of ANT to inform digital literacy in composition studies. Additionally, while the majority of literatures in ANT and composition studies delve into the theoretical orientations toward human and non-human symmetry with a discussion of either imaginary composing scenarios (Cooper, 2015; Fraiberg, 2010; Jordan, 2015) or personal teaching practices (Holmes, 2014; Rice, 2011), there are few empirical studies looking into the pedagogical

implications of implementing ANT in composition classrooms. However, as Cooper (2015) contends, through resisting generalization and explanation, the metaphysics of ANT is empirical in nature that serves to detect the details in the actual associations of things. Hence, there remains a gap between ANT-related studies, digital literacy, and composition scholarship.

In the field of education, on the other hand, scholars have elaborated on how ANT has been applied to empirical studies and ethnographic research (Fenwick & Edwards 2010; Fenwick, Edwards, & Sawchuk, 2011; Ivanic et al., 2009). Along with three other emerging approaches in the socio-material orientation, namely complexity theory, Cultural Historical Activity theory, and spatiality theory (Fenwick, Edwards, & Sawchuk, 2011), studies in ANT have become a burgeoning interest among educational researchers. The application of ANT in education (Fenwick and Edwards, 2010; Ivanic et al., 2009) has foregrounded the use of ethnographic methodology to trace the local sites of learning and micro-movements of things before extending local actors for broader social configurations and networks (Baynham & Prinsloo, 2009; Ivanic et al., 2009). In this light, ANT enriches the ethnographic methodological approaches through focusing on “micro” social relations and interactions.

It also becomes salient that educational researchers concur with composition scholars that ANT-related research and pedagogy should prioritize “description” over “explanation.” As Fenwick and Edwards (2010) assert, “The important point here is that ANT focuses not on what texts and other things mean, as in much qualitative research, but on what they do” (p. 8). Therefore, through tracking the micro-movements of actors in multiple local sites of learning, ANT in education serves to understand how actors connect with one another to form networks of activities that constitute digital literacy practices. The next section will present a review of empirical research of ANT and digital literacy in education.

Review of Relevant ANT Studies in Digital Literacy

Recent years have witnessed a profusion of education research implementing ANT to inform adult learners’ digital literacy learning. ANT-related research has garnered a broad spectrum of research interests in education, including but not limited to teaching and learning, curriculum-making, technological device, educational economics, educational reform and policy-making (Fenwick & Edwards, 2010). The following review of literature will provide a synopsis of ANT studies in education ranging from students’ day-to-day interaction with digital learning tools to students’ literacy practices in digital-based courses. Additionally, the dimensions of ANT research have been expanded to “translation,” “network assemblages,” “symmetry,” “multiplicity,” and “ambivalence” (Fenwick & Edwards 2010, p. 146). Although all five themes are conducive for conducting ANT research, the first three themes are most pertinent to developing ANT-

related pedagogy. Therefore, this section will discuss the first three themes through an analysis of relevant empirical studies in education. It also will examine what pedagogical implications can be drawn to complicate the “actant-pedagogy” proposed by composition scholars and inform digital literacy practices in composition classrooms.

Translation

Translation looks into how individual artifacts interact, whether they connect with one another to formulate networks, and how these things shift through their interconnection (Fenwick & Edwards, 2010). It is therefore worth noting that since pedagogical applications are mediated by “material things,” changes will occur in teaching and learning when material aspects of learning undergo shifts. Additionally, power is essential for construing the contexts and spaces undergoing translation in actor-networks, which addresses the critique of ANT as overlooking power relations (Fenwick & Edwards, 2010). The following empirical studies in education will demonstrate the translation of material artifacts and how it affects pedagogical applications in multiple sites of learning.

Translation occurs when textual meanings are transformed across contexts. Gourlay (2015) discusses the dynamic processes of translation through investigating into the day-to-day digital practices of twelve adult post-graduate learners at a British University. Drawing from ANT and post-human theory, the study is designated to enrich the scholarly work on academic writing through expanding the knowledge of meaning-making. The researcher utilizes multimodal journaling and conducts in-depth interviews with the participants of the study. Viewing material objects as part of the meaning-making process, Gourlay (2015) reveals the “dynamic process” of learning that highlights the transfer of technological devices across physical domains, in which digital devices serve as “mediators” transforming the meaning of texts across contexts. Additionally, the researcher notices translation in the sociomaterial assemblage of both print-based learning objects such as paper, pen, and highlighter and digital learning tools such as computer, camera, and software. The movement of texts between print-based and digital forms initiates transformation of textual meanings when learners engage in interactions with these artifacts.

In addition to highlighting the translation of texts across contexts in digital learning, scholars also demonstrate the power relations enacted through the process of translation. Bhatt (2012) has explored translation through examining the digital literacy practices of adult learners in the classroom setting. Conducting an ethnographic case study on an adult learner at a British University, the study aims to explore the types of digital literacy practices that involve adult learners fulfilling a writing project on a classroom computer (Bhatt, 2012, p. 292). The findings suggest that learners’ formal digital practices are connected to the learners’ informal digital practices in response to

the digital requirement of the program. The learner's digital literacy learning speaks to the movement in translation between social networking in the learner's personal life and course activities. The learner also tends to resist the restricted use of Moodle as an institutional site of learning, as well as the policy forbidding social-networking activities in school. Instead, she displays fluid digital literacy practices across different contexts such as home, work, and school. In this sense, translation is negotiated and circulated through the power relations between multiple actants. The learner's resistance to institutionalized power is central to the translation of her formal learning context with the profusion of informal learning tools.

Educational scholars thus have described the act of translation across different texts and contexts as well as the power relations manifested through translation. For Gourlay (2015), translation occurs when technological devices are being used across different contexts including school and home and when print-based objects and digital tools are being utilized across different texts including print texts and digital software. Not unlike Gourlay's (2015) findings, Bhatt (2012) has also found that the act of translation is manifested in the movement of digital networking websites across school, home, and work. Additionally, Bhatt (2012) has demonstrated the power relations enacted through the process of translation. The power relation between different actants, such as student actors and institutional polices is integral for describing the translation of digital texts across contexts.

Through this lens, the pedagogical implication for compositionists is the recognition of material objects, including digital and print-based artifacts, as "mediators" that transform the written texts and bridge the boundaries of learning contexts. Composition teachers could ask students to describe the digital and material tools they use and reflect on how they engage with the tools when working on multimodal composition projects such as designing a wiki page to illustrate their writing or making a short video to tell a narrative story. Specifically classroom discussions could include the impact of digital actors on the learners' multimodal projects, such as laptops, web pages, video camera, and editing software. Special attention can be paid to how meanings are transformed when different material and digital artifacts are being utilized. Additionally, future scholars in composition studies can also conduct empirical studies to examine the power relations between different actors and actants, as well as how and when they correlate with each other to make transformations across texts and contexts. Through this lens, composition pedagogies could be refined that take into account the complex transformations taking place when students engage with digital and material artifacts.

Network assemblages

Network assemblages look into the interrelation between multiple networks and the underlying force holding networks together (Fenwick and Edwards, 2010). It is worth

noting that material things can be assembled differently. Rather than considering networks and enactments as fixed and bounded in nature, a recognition of re-assembly speaks to the fluidity and changeability of digital practices allowing for the disappearance of some actors and emergence of new actors.

Educational research has interpreted network as a complex assemblage of human and non-human entities. Lea and Jones (2011) places emphasis on analyzing network assemblages in formal web-based learning practice of adult learners. The researchers specifically report an ethnographic research in the UK examining the digital practices of thirty-four adult language learners in a further education college. The researchers maintain meaning is co-constructed by modes, participants, and practices. In other words, Lea and Jones (2011) situate digital literacy practices within the network assemblage of social, textual, and technological aspects of learning. Through interviewing adult learners, the study has found that the hybridization of texts into incorporating technological aspects, such as hard copy and web-based resources, that complicate the assemblage of learning practices. The study also reveals that the web-based technologies play an active role in issues of assessment and plagiarism. For instance, the researchers notes that the act of plagiarism is not merely a technical issue but also a textual practice that exist in a complex assemblage of texts, technologies, and practices.

Thus, assemblage is an essential process to hold actors together for the formulation of networks; however, networks are also subject to the fluid processes of re-assembly. Thompson (2014) examines ANT as an everyday pedagogical tool through the delete button and deleting practices of eleven self-employed workers in an online community of learning. The study contributes to the uptake of ANT as involving complex interactions of livable assemblages and fluid artifacts. Deleting practices undergo shifts and transformations to meet the demands of new forms of online technologies. As adult workers use the delete button to manage their online footprint, there emerge new actors influencing the act of deletion, such as the protection of one's data privacy, the management of one's web identity, the management of one's presence online, and the overload of one's information online (Thompson, 2014). The act of deletion therefore creates a complex re-assembly of digital practice enacted by the disappearance of some actors and emergence of new alliances. Expanding the use of ANT as a conceptual tool to analyze online communities of practice, the delete button therefore provides new pedagogical lenses into the fluidity of digital assemblages through mobilizing and negotiating the learners' digital presence and absence.

In a similar vein, reassembly is manifested in classroom activities and assignments. Bhatt and De Roock (2013) have discussed the reassembly of one student's digital practices in a further education classroom. Combining video-analysis and ethnomethodology, Bhatt and De Roock (2013) aim to find out the in-class digital practice of the learner in relation to the student's social engagement. The findings

suggest the classroom assignment constitutes part of the socio-material assemblage of interactions through which the learner creates a “collateral network” reassembling classroom literacy learning with out-of-class digital activities. A conversation-analysis on the video data demonstrates long pauses between the student’s practice of using online resources and that of resuming classroom discussions on the assignment. The pauses, according to the researchers, reflect the student’s interaction with non-human actors such as the Google search engine. Bhatt and Roock (2013) hence note that Google’s algorithm or the search terms that google suggest also functions as a participant in the student’s learning process that occasionally interrupt the learner’s focus on the task of the class. Therefore, technological artefacts have taken an active role contributing to the fluidity of the student’s digital literacy practice. The study reflects the re-assembly of social and material actors that initiates fluid convergence between classroom learning and social interaction.

Therefore, educational researchers have illustrated network assemblages and the fluidity of re-assamblages. Lea and Jones (2011) have found the network assemblage to involve the actancy of modes, participants, and practice. Thompson (2014) and Bhatt and DeRoock (2013) extend the conversation on assemblage to cover the re-assemblage of networks. Specifically, Thompson (2014) have discovered that one of the technological actors, the delete button speaks to a re-assembly of adult learners’ digital literacy activities by way of interrupting the learners’ digital presence. Similarly, Bhatt and DeRoock (2013) have noticed the emergent literacy practices enacted through students’ use of Google algorithm. The technological device thus has re-assembled the student’s classroom activities through disrupting the unity and homogeneity of such practices.

In this light, compositionists can look into how networks are assembled and re-assembled in writing classrooms. For instance, writing instructors can ask students to describe their use of digital technologies and how the influence of the technologies on their digital learning. By way of inviting students to describe their experience, the instructor as well as the students can explore the fluidity of digital practices enacted through a heterogeneity of non-human actants. For example, discussions can focus on how digital appliances such as searching engines and social networking websites change student writers’ engagement with classroom activities. Future researchers in composition studies could also benefit from the focus on the assembly and re-assembly of the networks of learning. This focus is due to the fact that digital practices, in Thompson (2014) as in Bhatt and DeRoock (2013), do not always proceed according to the linear trajectory of learning following the “learner as designer” metaphor proposed by the New London Group. Rather, non-human entities such as technologies themselves could initiate unexpected changes and fluid interruptions to re-organize the digital practices. In this sense, more empirical studies can be conducted to look into

how the re-assembly takes place among the interactions of heterogeneous actors and the impact of these changes in writer's digital activities.

Symmetry

Symmetry denotes the equal treatment of human beings and non-human entities as having the capability of initiating changes on each other when they are held together in actor networks (Fenwick & Edwards, 2010). Counteracting the dominance of human intentionality over material objects, symmetry stresses the significance to recognize the agency of material things as well.

Agency has been construed as attributable to an amalgamation of human intention and non-human materiality. Knox and Bayne (2013) look into "E-learning and Digital Cultures," a Massive Open Online Course (MOOC) to delve into complex assemblage of human intention and non-human materiality. The study has revealed that MOOC allows for the blurring of the boundaries between human and non-human actancy. Encompassing the codes and algorithms of a word-cloud generator, the assignments on MOOC create multiple spaces which can be distributed to an intricate array of participants, not confined to human control and intention. Additionally, with the use of "Videoscribe" software, "E-learning and Human 3.0" on MOOC presents the writing hand of the teacher, thereby reducing the author's authority and dominance in the video. Through interactions with animations and visualizations, the teacher's body is entangled in a fluid assemblage with other bodies, including texts and images that co-construct the non-human actancy. The findings have debunked representational thinking, an overemphasis on the agentive power of human language and culture engendering an asymmetrical subject/object dichotomy between culture and nature, humans and materiality. Rather, the researchers critically examine digital literacy practices as a socio-material assemblage and enactment including mixture of multiple agencies including human and technological artifacts.

Educational research also illustrates the circulation of authorship among human and material actors. Using the method of focus group discussion, Gourlay and Oliver (2014) examine the digital literacy practices of twelve adult learners in diverse settings both in and out of school. The researchers have found that a wide range of non-human materials are imbued with actancy. That is to say, technological tools and digital devices make active changes in the learning process when being used by the student participants. For instance, one student has mentioned in the focus group discussion that "my third half of my brain is Google scholar" (Gourlay & Oliver, 2014, p.150). This instance illustrates the conducive changes made by these technologies. Aside from the benign functions related to digital tools, some students also reveal their struggle using the technological devices. For instance, some participants have described the "control" of technologies in their private lives as malevolent. Gourlay and Oliver (2014) have

therefore concluded that students need to adapt their practices to work with these non-human “mediators”. The findings have railed against the perception of material artifacts and digital devices as passive learning tools under the manipulation of human agents, shedding light on the active role played by material artifacts to co-create authorship.

In this sense, educational researchers have understood actancy as co-constructed by a mixed assemblage of human actors and digital materiality. Through analyzing the design of an online course, Knox and Bayne (2013) have found that MOOC provides digital resources that challenge the dichotomy between human and non-human actancy. Gourlay and Oliver (2014) also reveal from the students’ perspectives how technologies and humans co-create authorship through maintaining control over and initiating changes on each other. These studies highlight that digital technologies, once treated as a passive entity in digital practices, assume agency just as human beings do, and can exert both positive and negative influence on the learning process.

In composition classrooms, this recognition of symmetry can be used for promoting the actant-pedagogy. The key notion of symmetry is a view of actancy as co-constructed by a mixture of humans and materiality. Through this lens, writing teachers could invite students to describe their interactions with digital technologies, highlighting the distribution of authorship between learner users and digital tools. For instance, throughout the process of completing multimodal projects, students can discuss how they conceptualize the impact of digital technologies on writing, such as how Google scholars and Wikipedia exert benign or malevolent influences on their processes of composition. Teachers could also make use of digital tools that decenter instructors’ agency in the learning process. For instance, digital tools such as “E-learning 3.0” provides the platform for a new form of presentation highlighting both human and non-human elements. Additionally, composition researchers can conduct empirical studies looking into how teachers, learners, and technologies interact with each other in digital practices, and how to deal with learners’ struggle with technological devices.

Conclusion and Future Directions

Recent literature in composition studies has employed ANT as not only a theoretical move but pedagogical tool in adult writing classes. Although recent scholars have theorized how to incorporate the discussion of ANT into rhetoric and composition through the promotion of the “actant-pedagogy,” there are few empirical studies examining the use of ANT to benefit digital literacy practices and composition pedagogy. In this light, this article has argued for more studies to be conducted to explore the pedagogical implications of ANT in composition classes.

Additionally, this article has also elaborated on the scholarly effort among educational researchers in conducting empirical research to bridge the gap between

ANT and digital literacy. The review of literatures focuses on three aspects of ANT that are most germane to enhancing composition pedagogy for adult learners, namely translation, network assemblage, and symmetry. The three aspects of ANT share an understanding of the agentive role played by both human and non-human actants in digital literacy practices.

Through this lens, future researchers interested in developing the “actant-pedagogy” could incorporate more complex and systematic pedagogical lenses than a “description” of actors in networks. Albeit that the individual actors constitute an integral part of ANT, compositionists need to move beyond tracking and describing the actancy of different actors on a generic level. Instead, future compositionists should look more closely into specific pedagogical implications of translation, network assemblages, and symmetry when different digital technologies are being used. That is to say, there is a need for scholarly works and pedagogical activities that describe how digital tools translate textual meanings across contexts, how these actors are assembled and re-assembled in the network of digital learning, and how these actors enact actancy through their symmetry and embodiment. To this end, more empirical studies should be conducted that delve into the digital practices of adult learners in composition classes.

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