

Strategies for Learner-Generated Comic Production in Classroom: A Comparative Analysis

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Abstract—Essentially, comics are one of the most significant medium in transmedia storytelling for education. However, limited attention has been paid to the methodical analysis on learner-generated comic production. Thus, this paper examines recent strategies used by teachers and instructors in implementing learner-generated comics in classroom. Hence, the definition and evolution of comics is enlightened, followed up by how comics demystified diverse educational benefits by playing roles as cognitive and affective tool. Then, educational comics characteristics and the concept learner generated comics are discussed. Next, a comparative analysis is conducted on the educational practices in learner-generated comic production. The analysis is based on brief descriptions and disadvantages on the learner-generated comic techniques applied in classroom setting. Generally, a qualitative approach is applied to compare the listed strategies. The results suggest that a substantiated and unified conceptual learner-generated comic production model will encompasses the fundamentals of comic, story, and learning where the assessment scheme has been overlooked.

Keywords—flexible parallel bar; physiotherapy; disability.

I. INTRODUCTION

L earning ecosystem in the age of Industry 4.0 involves trainers, explainers, and sustainers in ensuring a connected, embedded and a symbiotic culture to learn, structure and to occupy [1]. Learners must adopt beyond trans-

literacy skill which is the ability to communicate across a range of platforms, tools and media [2]. Congruently, transmedia facilitates student-centered and technology-supported approaches to learning in media convergence era [3]. Transmedia storytelling represents a process where integral elements of a fiction get dispersed systematically across multiple delivery channels from film, television, advertising, games, social networks to comics [4]. As textual production, user-generated content is one of the most pertinent and projecting phenomena emerging from the new media ecology [5]. To this point, learner-generated content practices have continually yielded positive pedagogical outcomes [6]. Compatibly, recent advances in comic authoring tools enable ubiquitous attempts for educators and students to design their own learner-generated comics [7]. Thus, this paper collects some core concepts of comic's primary roles in education, characteristics of educational comics, and learner-generated comic production strategies in classrooms.

II. COMICS IN EDUCATION

Chiefly, [8] defined comic as “juxtaposed pictorial and other images in a deliberate sequence, invented to convey information and/or to produce an aesthetic response in the viewer”. In contemporary condition, according to [9], comics are social artefact communicated in visual language. Based on these definitions, comic appears to have several key features: narrative; pictures, images or art; and sequences. With the arrival of digital technology and displays, this interactive comics offer spectacular reading experience by incorporating rich multimedia elements such as

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sound and animation. Comics become digitally interactive when they are able to accept mouse click, drag, text, and touch input [10] [11]. As a further remark, hyper-comics expands the feature of interactive comic with non-linear story structure [12].

Furthermore, comic sequences are affected by replacements of page turn, panel spacing, and layout influenced by canvas scrolls [12]. Interaction with digital comic involves eye-tracking, voice control, facial expression recognition, gesture recognition, keyboard control, touch screen control, and handle control [13]. The animated illustrations, music, and sound effects were found to be beneficial in multimedia stories, but the interactive elements such as hotspots and games are distracting in contrast [14]. Thus, this drawback provides a direction for this study to focus on non-interactive comic.

A. Comics as a Cognitive and Affective Tool

Recent years have witnessed a growing appreciation towards comics which are now capable to address almost any subject from fiction to non-fiction, without age boundaries [15]. According to [16], the relevance of comic in the classroom was justified based on several bases such from political, theoretical to research as listed below.

- popular culture
- multi-literacies
- Multi-modal
- multi-cultural
- young adult literature
- arts-integration
- reading comprehension and motivation
- media literacy
- technology-integration
- standards-driven

Predominantly, comic books, comic strips and graphic novels have demystified diverse educational benefits in classroom settings. For example, [17] reported that students practice moderate level of synthesis and thinking skills through by reading and reflecting through comics. This was exhibited earlier in [18]'s

experiment where learners related to the character archetypes. Then, they were instructed to compare themselves with the comic character by composing fictional diary entries.

With educational comics, comprehension is achieved because their lively illustrations accompanied by limited text and panels interplay capture the story's content at full extent [19]. Comics contributed more than visual aids for language and TESOL learners [20] where linguistic items are acquired in incessant sequence without altering the readers' point of view. Besides piquing students' interest and motivation, supporting learning goals such as verbal and written communications, building, problem solving, and enhancing critical thinking skills were also developed catalyzed by innovative use of educational comics [21].

On the other hand, comic is also an emergent narrative in games [22]. As a result, visual communication techniques in comics are increasingly included in the digital tool-set of information designers [11]. These evidences are among the massive accomplishments of comics in education.

B. Characteristics of Educational Comics

Educational comic is defined as a form of cartoons in which a cast of characters present an educational story in a sequence of closely related drawings designed to entertain and educate the reader [23]. Conversational language in comics was able to transform rigid information into soft or simple words to make educational content accessible and understandable [24].

[25] acknowledged that; educational comic development must be well-grounded according to the roots of sequential art and graphic narrative history (comic), script (story), and pedagogy (learning) (refer to Figure 1). The foundation is comic is the visual vocabulary in communicating meaning, connected through events in story that impacts learning which is the gained knowledge. Equivalently, [26] also strongly established educational comics into visual (comic), narrative (story), and knowledge (learning) dimension.

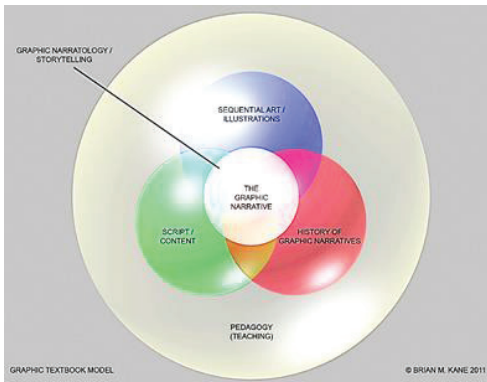


Fig. 1. Graphic Textbook Model [25].

While stories in comics are often fictional, all forms of fiction are based on or at least partially inspired by truth [27] where stories take place exclusively through the informal curriculum which influences a learner's conceptual understanding of a given topic. According to [28], educational comic is a subset of comics that specifically variously designed to extend student learning and foster engagement beyond the confines of the classroom. Figure 1 shows how difficult scientific concept in biology is visualized in a form of comic.

The arrangement of panels, position of balloons, and explanatory text is carefully arranged to allow readers to grasp the comics' educational content (see Figure 2). [28] further classified two types of educational comics which are 'technical' and 'attitudinal'. Technical comics teach learners the procedures, process, and tasks which involve the reader to experience them in sequenced form. Attitudinal comics function as a visual narrative in conditioning learners' attitude toward a task. Readers are influenced by the comic's message when character behavior is then imitated. In summary, educational comic is classified into two categories; namely comics with factual content and comics for attitude formation [29].

While educational comics are able to instruct learners to content comprehension, the didactic constituents in non-academic comics is utilized by collaboratively analyzed to build knowledge. On the whole, there is seem to be a tendency among researchers to explore the potential of constructive learning

through educational comic production. These educational comics which are generated by learners, then finalized into a digital form is called learner-generated comic (LGC). Thus far, limited attention has been paid to methodical analysis on learner-generated comic production. Therefore, the next section expands the discussion on LGC.

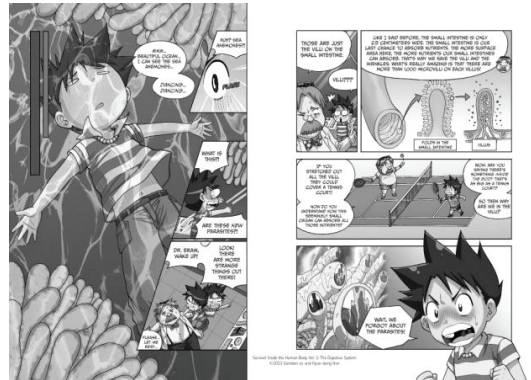


Fig. 2. Example of a educational comic by Korean publisher.

III. LEARNER-GENERATED COMIC

This section explores LGC production strategies in classroom reported in literature, highlighting how comic principles and storytelling techniques are adopted.

A. LGC for Communication Theory

In [30]'s research, students were given a LGC project to express how interpersonal exchange in communication theory works. A tutorial on Pixton comic authoring tool was presented before the assignment took place. Besides learning the basic steps to create new comic, character, add background, and send their finalized output for grading, students were also persuaded to try other useful features of Pixton Manuscript format.

There were three main components in the LGC activity. First was focusing on the comic production itself. The instructor specified certain guideline for comic creation such as the maximum amount of panels. Storywise, there should be a variety, interesting yet unrestricted number of characters with active roles, backgrounds, and text. Next, students were asked to formally examine interpersonal

exchange theoretically in a rationale paper. The feedback exposed that only one out of 25 students preferred formal paper report compared to LGC. Finally, a peer feedback session was conducted to share learning experience using Pixton's built-in commenting functions. In the debriefing session, the best selected comics were presented on the screen, conversing how comic elements and narrative creatively and successfully informed students about communication theory. In a nutshell, the students valued LGC production that tackled the main concepts in the subject by relating them to real life situations.

B. LGC for Visual Literacy

An experimental study by [31] explored comics as a form of visual rhetoric and multimodal communication. Students engaged in design by using multiple modes to create various informative media, such as hand-drawn, digitally drawn, juxtaposed, sequential, and photographed stories. Students were firstly instructed to read the provided graphic novel before proceeding with the assignment. Students feedback include that the hardest part of the LGC project was making the switch from text based storytelling to visual based story telling. Mainly, planning process of the comic was more helpful than traditional drafting process. However, students' plans were more grandiose than their finished product. Several students responded that the toughest task in LGC production is fabricating theme, layout, and structure. This was because elements change and things are added or subtracted, making the documents comic more complex. Fitting certain panels and text on certain pages and making good or stylish pages were regarded problematic. It was difficult to ascertain they had enough text on each page, but not too much. Plus, ensuring that details were not duplicated between the written and graphical ideas became problematical. Apart from that, challenges involved figuring out how best to present the information what narrator, tone to use, getting the wording right and simple, and formatting the story to get punch lines to occur in the last panel of a row. Generally, the project permitted

students to present technical instructions in a more informal way.

C. LGC for Medical Narrative

Works by [32] described an innovative course on comics and medicine for 4th-year medical students. In this course, students learned to read and create their own medical related stories using the comic format. After the comics exposed students to a set of medically relevant graphic narratives that provoke critical reflection about the experience of illness and the ways patients and their families interface with the medical system, they will equip students with critical thinking skills for reading and understanding comics that are relevant to medical practice. This way, students' creativity is nurtured as they develop their own stories into original graphic narratives.

These goals are achieved via a seminar-style course that meets twice weekly (two and a half hours per session) for two weeks. During each session, students engage in three distinct activities: discussion of readings; an in-class exercise; and sharing-progress on their final projects. Specific session topics include (but are limited to):

- Why comics are relevant to medicine
- Elements of storytelling
- The relationship between images and words
- Exploring point of view
- Drawing comics
- Writing dialogue
- Social context of medicine
- Final presentations

Students finally produced their own original graphic narrative based on a personal experience from medical school. Despite the fact that most of the students have little confidence or experience drawing comics at the outset of class, these learners consistently produce works that reveal their wry humour and personal transformations as well as observations about modern medicine.

D. LGC for Social Studies

Pioneering LGC production in classroom setting, students in [33]'s experiment was able to develop their writing, comprehension, and research skills.

In their LGC project, students explored a particular topic in social studies in two to three weeks' duration. Upon familiarization of topic, students illustrate their own comic manually. Finally, the completed LGC were compiled in booklets and presented to the public in an open booth.

E. LGC for Exploring Empathy, History, and Story
Another early attempt of introducing LGC in university curriculum, [17] enlightened how LGC production allowed multi-disciplines practice from art to social studies. Several storytelling techniques were explored. It started from character and space creation. Personal stories were inspired from observation, own experience, and written journal. Aside from that, genre also assisted the students to prepare the narrative, following its conventions. The LGC activity was conducted in a workshop environment separated into small groups.

[17] also reported her findings in LGC secondary classroom project. It was a twelve weeks' curriculum duration where students produced comics about human rights. Before the production, students read selected graphic novels in groups to explore art styles and comic design. Then, thumbnail storyboards were developed based on students' paper researching the subject. The finalized LGC displayed massive range of styles, designs, and techniques. Producing LGC had opened a path for students' active participation, self-exploration, and exposed to pertinent social issues. Experiences from [17]'s study confirmed that LGC is a powerful method for students to envision the future, recognize history, self-narratives, empathy, design, and technology.

F. LGC for English Reading Comprehension

To assess reading comprehension, [34] conducted a LGC pilot study. After reading an academic topic, students were instructed to produce a digital comic summarizing their understanding. Students were merely told that it could be helpful for them to read a comic example before proceeding with the assignment. Comic Life tool was used to generate the comic.

The comic was a mix of summarizing, paraphrasing, restating and quoting, the students

were directed to work in groups to determine what each text balloon on the comic was an example of. Evaluation methods involved the observation from instructor, peer feedback, and questionnaire. Positive results were shown in term of comprehension and assessment.

G. LGC for Social Gaming

Social Comics is presented by [35] which generated LGC in a casual video game environment. Merging sociability, physicality, and authoring game elements, players will act, driven by creativity. The main aim of the game was to create a comic strip and this is clearly established by the players with very little explanation. An early prototype of Social Comics used a motion capture system to track the position of the players' heads in real-time so that the speech bubbles and their arrows would follow their associated character. Two speech bubbles appear in every panel of the comic, suggesting that at least two people participate in the authoring process. The text in the speech bubbles gave the players room to explore their creativity while still providing structure to the game. There was also no restriction on other people joining the game or giving suggestions to the players. Finally, players must use their entire body to pose in the panels, and can use props and hats to change their appearance.

H. LGC for Literary Composition

Combination of words and pictures deliver meaning was scrutinized in [36]'s LGC project which spanned for five weeks. Initially, storyboards were drafted to plan the narrative such as scenes, dialog, narration and additional characters. Once they were done, a digital version of the comics was generated using Comics Lab and Comics Lab Extreme tools on Professor Garfield website. Then, background, objects, facial expressions and body gestures variation for characters were selected in the tool. Next, dialogue was inserted into speech or thought balloons. Finally, the completed LGC were exported as web pages. The outcome exhibited students had successfully performed the complex process of producing digital comics compared to traditional text. Based on this experience, Maldonado and Yuan

recommended that students should be exposed to the foundation of sequential art before producing LGC using digital applications.

IV. COMPARATIVE ANALYSIS OF LGC PRODUCTION IN CLASSROOM

Comparative analysis is conducted on the educational practices in LGC production. Although LGC is mentioned in immense of papers, selection of studies for this analysis are based on the comprehensiveness of their discussion on LGC. Another requirement is the work must include visual samples of the produced LGC. Earlier studies from 2002 are also chosen to explore how LGC in classrooms has progressed in various domains. The analysis is based on brief descriptions and shortcomings on the LGC techniques applied in classroom setting. A qualitative approach is applied to generally compare the listed strategies as depicted in Table 1.

TABLE I. LGC PRODUCTION COMPARATIVE ANALYSIS

Domain	Descriptions	Limitations
LGC for Communication Theory [30]	<ul style="list-style-type: none"> • Comic basic elements guide is provided. • Technical aspects of authoring tool are introduced. • The strategy uses shared learning experience approach where students connect core concepts through comic narrative. 	<ul style="list-style-type: none"> • Assessment approach on LGC products is not explained. • Narrative technique is not elaborated.
LGC for Medical Narrative [32]	<ul style="list-style-type: none"> • Comic elements are introduced by reading several comics. • Complete simple STEM narrative technique is used. • LGC final products are shared among the peers. 	<ul style="list-style-type: none"> • Assessment approach on LGC products is not explained. • No authoring tool is used.
LGC for Social Studies [33]	<ul style="list-style-type: none"> • Comic elements are comprehensively discussed. • LGC final products are shared among the peers. 	<ul style="list-style-type: none"> • No authoring tool is used. • Narrative technique is not elaborated.

LGC for Exploring Empathy, History, and Story [17]	<ul style="list-style-type: none"> • Comic elements are introduced by reading McCloud (1993)'s text. • Narrative is composed by observation and personal stories inspired from experiences and written journal. 	<ul style="list-style-type: none"> • No authoring tool is used. • Assessment approach on LGC products is not explained. • Learner-generated content concepts are not considered.
LGC for Literary Composition [36]	<ul style="list-style-type: none"> • Storyboard is created before comic production. • Students repeatedly revised the dialogues 	<ul style="list-style-type: none"> • Narrative technique is not elaborated. • Assessment approach on LGC products is not explained.
LGC for English Reading Comprehension [34]	<ul style="list-style-type: none"> • Reading comic before comic creation is optional. • The LGC is a combination of reviewing, paraphrasing, reaffirming and citing of the topic. • Technical aspects of authoring tool are introduced. • LGC assessment is done by covering the key points accurately and concisely. 	<ul style="list-style-type: none"> • Comic principles are not discussed. • Narrative technique is not elaborated.
LGC for Social Gaming [35]	<ul style="list-style-type: none"> • Authoring tool allows players to participate in live comic strip creation and in interactive authorship of new content. 	<ul style="list-style-type: none"> • Intended to explore gameplay experiences instead of educational outcome. • Narrative technique is not elaborated.
LGC for Visual Literacy [31]	<ul style="list-style-type: none"> • Comic elements are introduced by reading selected graphic novel. • Students compose reflection pieces. • Pixton and Comic Life authoring tool are used. 	<ul style="list-style-type: none"> • Assessment approach on LGC products is not explained.

From the comparative analysis, it was noticeable that, between the discussed LGC production classroom practices; the adoption

of learner-generated content concepts, storytelling elements, and comic principles are unparalleled against each other; such as single or two elements from comic, story or learning are ambiguously described. Importantly, a benchmark for assessing the produced LGC is nearly absent from majority of the papers. Without digital media principles understanding and a good assessment rubric, it would be unfeasible to evaluate them objectively [37]. The limitations from the comparative study led to the suggestion that; a substantiated, unified conceptual LGC production which encompasses the fundamentals of comic, story, and learning with assessment scheme has been overlooked. As emphasized by [38] in his seminal work on transmedia storytelling, educators should model effectual use of various media platforms in classrooms. Therefore, in order for comics to play active role in transmedia education, a strategic and systematic method of LGC production should be cogitated for immersive experience through transmedia storytelling.

V. CONCLUSION

Besides films, novels, and video games, one of the most recognizable channel in transmedia storytelling is comics. In classroom setting, learner-generated comic (LGC) approach contributes to both active learning and deep learning. Thus, through comparative analysis; this paper concisely explores LGC production strategies in classroom reported in literature, highlighting how comic principles, storytelling techniques, digital tools are adopted. Results from comparative study revealed that the LGC strategies applied in classroom are varying in adopting comic, story, and learning elements; and a benchmark for assessing the produced LGC is nearly absent; despite their fundamental importance. Therefore, dedicated research must venture towards a purposeful and holistic LGC production strategy that should encompass the fundamentals of comic, story, and learning which not only guide learners to grasp the gist of LGC; but also transfer their knowledge into an accessed digital educational comic.

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