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**TRANSFORMING MASSIVE OPEN ONLINE COURSE (MOOC) EXPERIENCES:
MAYER'S COGNITIVE THEORY OF MULTIMEDIA LEARNING (CTML) IN ACTION**

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2 September 2023

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Mickey Angel Cortez
September 2, 2023

Acceptance Page:

This paper prepared by **CORTEZ, MICKEY ANGEL T.** with the title:
**“TRANSFORMING MASSIVE OPEN ONLINE COURSE (MOOC) EXPERIENCES:
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” is hereby accepted by the Faculty of Information and Communication Studies, U.P.
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Biographical Sketch

Mickey Angel Cortez (she/her) or “Mickey” for short is a 23-year-old gal from Novaliches, Quezon City.

She has been an advocate of Media and Information Literacy (MIL) since Senior High School wherein she graduated as the Batch 2018 valedictorian, hailing from the Humanities and Social Sciences (HUMSS) strand.

Beyond academic pursuits, she is now a professional instructional designer. Also a former freelance events and webinar host who enjoys facilitating events and energizing the crowd. She had several virtual hosting stints in UPOU as an undergraduate of Multimedia Studies. Additionally, she served in UPOU University of Student Council VolCorps as an events and STRAW desk volunteer.

As a social media-savvy Gen-Z, she is well-versed in the intricacies of social media, including pop culture, memes, and trends. She has successfully collaborated with both private and government organizations. Through designing social media collaterals and pitching content, she has contributed to the reach and engagement of the social media campaigns and advertisements she has worked with.

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Abstract

In the era of remote, modular, and self-paced digital learning, this study applies Mayer's 12 multimedia principles from Cognitive Theory on Multimedia Learning (CTML) into Open Educational Resources (OERs) for a specific Massive Open Online Course (MOOC) at the University of the Philippines Open University – *Media and Information Literacy in Today's World*, which ran for 7 weeks (July 3 - August 22, 2023). The Multimedia OERs observed in the study include infographics, motion graphic videos, summary slides, and a Google Sites course package. Aligning pedagogical strategies with multimedia design principles, this research investigates integration's impact on learning experiences and cognitive load management. Methodologically, it involves qualitative and quantitative analyses of data from 766 survey respondents out of 2986 enrollees. Findings reveal 100% achievement of learning outcomes, full and partial support for multimedia principles, reduced cognitive load in comprehending complex lessons, and a rich and interactive media learning experience for participants. It also explored a multitude of benefits and a few challenges in implementing Multimedia OERs in MOOCs from the learners' perspectives. The study contributes to the growing literature on multimedia learning, MOOCs, and OERs, and offers practical insights for digital education stakeholders (e.g., instructional designers, multimedia practitioners, course coordinators, course enrollees, and distance learning institutions).

Keywords: Massive Open Online Courses (MOOC); Open Educational Resources (OER); Cognitive Theory of Multimedia Learning (CTML); Cognitive-Affective Theory of Multimedia Learning (CATML); Multimedia Principles

I. INTRODUCTION

Background of the Study

In today's digital era, the integration of technology in the educational setting has brought about significant changes and opportunities for learning. Globalization and modernization have already necessitated the application of digital technologies instead of being a mere adjunct to teaching and learning (Haleem et al., 2022). Information and Communication Technologies (ICTs) have revolutionized the way education is delivered, enabling innovative approaches such as e-learning, online learning, blended learning, distance learning, and Massive Open Online Courses (MOOCs) (Arinto, 2013; Pavel et al., 2015; Salas-Rueda et al., 2022; UNESCO, 2023). Through the implementation of ICT in education or Educational Technology (EdTech), online platforms have become available for conducting classes, sharing resources, doing assessments, and managing the day-to-day activities of academic institutions. During the onset of COVID-19 when the lockdowns and quarantine protocols prohibited face-to-face (F2F) classes and activities, alternatives were sought for the continuity of education. The pandemic has forced the institutes to adopt the online teaching mode to sustain the education system, further accelerating the adoption of distance learning modalities, and highlighting the importance of digital tools and platforms for educational continuity (Ali, 2020). It also popularized the terms, “distance learning,” “blended learning,” “online learning,” “modular learning” and terms that fall in-between, such as Modular Distance Learning (MDL).

MDL refers to Personalized teaching methods that enable students to utilize Self-Learning Modules (SLMs) in either print or digital format, depending on what suits

their learning needs. Additionally, various educational resources such as learner's materials, textbooks, activity sheets, study guides, and other materials are made available to support their independent learning journey (Department of Education (DepEd), 2022). According to the July 2022 report by DepED, Modular Distance Learning MDL was the top learning modality implemented in the country, with a scope of 75.1% or 20,688,555 learners in all levels and sectors, ranging from Kindergarten to 12th grade. As defined by UNESCO (1988) as cited in Ali et al. (2010), a *module* is a learning resource organized around a specific topic, elements of teaching, clear learning objectives, activities, and evaluation using criterion-referenced assessment.

Although Modular Distance Learning (MDL) as an alternative mode of instruction was the most preferred route of education when face-to-face classes were not possible (DepEd, 2022), one of the major challenges faced during the pandemic in the field of education was its implementation. Several local and international studies have investigated the challenges of text-based and activity-centered MDL during the pandemic from the perspective of students, such as: **struggles with reading comprehension** (Abbas, 2021; Aquino & Tingson, 2021; Boholano et al., 2022; Gueta & Janer, 2021; Libre III & Decano, 2021; Valentos & Decano, 2021); **inability to study independently** (Dangle & Sumaoang, 2020; Gueta & Janer, 2021); **cognitive overload due to the number of activities and vague instructions** (Bustillo & Aguilos, 2022; Dangle & Sumaoang, 2020; Dargo & Dimas, 2021; Gueta & Janer, 2021; Olivo, 2021; Rotas & Cajapay, 2020; Tugano, Tria, & Tonio, 2022) and **lack of motivation to learn** (Abbas, 2021; Bustillo & Aguilos, 2022; Gueta & Janer, 2021; Libre III & Decano, 2021; Valentos & Decano, 2021); and **ineffectivity of learning and merely submitting the modules for compliance purposes** (Anzaldo, 2021;

Boholano et al., 2022; Bustillo & Aguilos, 2022). Furthermore, the heavy reliance on text-based modules in MDL may not cater to all learning styles and can contribute to a learning gap among students, especially in a country like the Philippines where access to quality education resources may be limited.

To resolve this learning gap, several studies call for the use of supplementary learning resources and other media modalities in conjunction with text-based modules. The article by Magsambol (2020a) recommends the simplification of modules and workbooks by integrating video-based and audio-based lessons aligned with Most Essential Learning Competencies (MELC). Congruently, Valentos & Decano (2021) attributed the students' declining interest in reading to their extensive engagement with technology, primarily spending significant time playing online games, while also noting the informants' request for audio-video recorded lessons. Such is corroborated by the study of Tanucan et al., (2023), reporting that the “structure” of modules (i.e., design and content) with visualizations, such as tables, images, photographs, illustrations, comics, and diagrams can help to increase the students' motivation to study and facilitate reading comprehension. In the same vein, Libre III & Decano (2021), recommends introducing a range of diverse reading and learning materials that cater to all student's learning styles and needs. They also discovered that incorporating relatable printed and advertising media into the modules serves as a motivational force for students to read and study. Therefore, in this digital age wherein the learning needs and styles of learners are evolving due to intensive exposure to rich media, there is a need to explore alternative approaches and instructional materials that can address these challenges and enhance learning outcomes.

Learning resources formulated for conventional learning settings may not be inherently compatible with the requirements of distance learning environments. Thus, amidst the pandemic, teachers also faced challenges in adapting instructional materials to meet the requirements of distance learning (DL). Moreover, Modular Distance Learning encountered a scarcity of resources and learning materials (Boholano et al., 2022). Thus, the creation of materials such as modules, video lessons, presentation slides, and handouts were hurried, struggling to achieve the intended learning outcomes to the best extent possible (BusinessMirror Editorial, 2020 as cited in Manlapaz, 2020). In an interview, education Undersecretary Diosdado San Antonio stated that not all modules developed during the current year underwent a comprehensive quality assurance process (Magsambol, 2020b), hence compromising the quality of education, knowledge transfer and retention, during the pandemic.

Therefore, this study proposes that **Open Educational Resources (OERs)** are promising materials for enhancing modular distance learning experiences. The term "open educational resources" came into existence at a conference held by UNESCO in 2002 (Khanna & Basak, 2013). **OERs** refer to freely accessible educational materials that come with an intellectual property license, allowing for their reuse, adaptation, combination, and redistribution (Havemann, 2016). Thus, they can be used by educators and learners worldwide for teaching and learning.

Aside from formal education (K-12 and Tertiary Education), lifelong learning routes, such as **Massive Open Online Courses (MOOCs)**, provide an ideal platform for the integration of Open Educational Resources (OERs). In the context of Open and

Distance Learning (ODEL), there is a common scholarly practice to analyze MOOCs and OERs in conjunction with one another (Andone & VasIU, 2014; Ebner et al., 2016; Friestad-Tate et al., 2014; Hajri et al., 2019; Holotescu, 2014; Ingavélez-Guerra et al., 2020; Ossiannilsson et al., 2017; Piedra et al., 2014; Shigeta et al., 2017). MOOCs are online courses – usually free of charge – that are open to many participants (150 and above) and offer flexible access to educational resources and interactive learning experiences (Conole, 2016). Through the years, MOOCs have gained significant attention as they transcend traditional educational boundaries, allowing learners from diverse backgrounds to access high-quality educational content on a global scale (Hew & Cheung, 2014; Liyanagunawardena, Adams, & Williams, 2013); upskill; and gain micro-credentials that they can use as leverage for their careers. MOOCs continue to gain popularity since it first gained prominence in the early 2010s (Peña-Bandelaria, 2020; Romualdo, 2017), and the importance of utilizing effective instructional strategies to ensure that learning outcomes are achieved in these courses becomes increasingly important.

OERs encompass a wide range of resources, including textbooks, lecture notes, videos, and interactive multimedia. According to the 2020 report by the United Nations Educational, Scientific and Cultural Organization (UNESCO), OERs have been found to improve access to quality education and enhance learning outcomes (UNESCO, 2020). Several studies have consistently demonstrated the positive impact of OERs in distance learning settings, such as enhancement of student learning experience, increase in the learners' level of interest and motivation, and alignment to various learning styles (Itasanmi, 2020; Rowell, 2015). Other benefits observed in the students are usefulness as supplementary materials to modules and textbooks vs.

modules and textbooks alone (Cheung, 2017; Harsasi, 2015); cost-effectiveness (Rowell, 2015; Itasanmi, 2020; Hilton III, 2020); enhanced internet and digital skills (Harsasi, 2015; Zuhairi et al., 2019); faster process of learning and comprehension of complex topics (Afolabi, 2017; Harsasi, 2015). Therefore, by utilizing OERs in distance learning settings, educators can provide learners with high-quality, accessible, and customizable learning resources that promote self-directive yet active learning and enhance the overall educational experience despite the lack of face-to-face interaction.

The University of the Philippines Open University (UPOU) has been a pioneer in distance learning and MOOCs in the country. Since 2013, UPOU has offered a variety of MOOCs in collaboration with local and international partners, covering subjects such as environmental management, information technology, entrepreneurship, public administration, and teacher education. UPOU embraces openness by utilizing open educational resources (OERs) and open-access software in its learning management system. The university employs the MODeL platform, based on Moodle, to deliver MOOCs and provide learners with access to course materials, interactive activities, and collaboration. UPOU actively promotes the use of cost-effective and high-quality OERs, although students lack knowledge about licenses and development processes. Additionally, UPOU has actively promoted the use of OERs since 2011, as they are cost-effective and of high quality. UPOU integrates multimedia resources, such as videos, images, publications, and games, into its course materials to enhance the learning experience, cater to different learning styles, and increase the accessibility of its MOOCs. By utilizing MOOCs, OERs, and

multimedia, UPOU aims to provide quality education to a wider audience through the spirit of open education and create an inclusive learning environment.

However, as asserted by Friestad-Tate et al. (2014), there exists a vital need to recognize and comprehend that even when students watch video presentations within a module, their genuine engagement and effective interaction cannot be guaranteed. Merely having the technological teaching tool in operation does not guarantee active learning, as not all individuals thrive in solitary learning environments. Thus, instructional designers must ensure the proper design, development, and implementation of OERs to ensure their quality and effectiveness. Harnessing the potential of educational technology necessitates incorporating concepts and theories grounded on adult cognitive and learning processes.

Therefore, to optimize the effectiveness of Open Educational Resources (OERs), it is imperative to anchor their design on robust multimedia theories. In this regard, **Richard Mayer's Cognitive Theory of Multimedia Learning (CTML)** offers significant potential in the realm of multimedia-based learning. Richard Mayer's theory posits that effective multimedia learning occurs when learners engage with instructional materials that are deliberately designed in a way that lessens cognitive load, facilitates active processing of information, and utilize multimedia principles (e.g., signalling, segmentation, and coherence) in combining texts, images, graphics, and audio for instructional materials. Visual-based information has long been acknowledged as a powerful medium for learning, primarily due to its ability to engage learners and facilitate comprehension (Mayer, 2009; Sweller, 2011). By incorporating visuals such as images, graphics, diagrams, and videos, OERs can effectively reduce

cognitive load, promote active learning, and enhance understanding (Mayer, 2009). Multimedia instructional materials that effectively combine words and images can enhance learning and recalling by targeting the visual channel of the brain as well (McGraw Hill Canada, 2019) as opposed to using texts alone. Several meta-analysis and experimental studies by Mayer and other researchers attest to this claim, reporting that the use of multimedia principles lead to *increased learning outcomes in terms of transfer and retention rates*, (Adesope & Nesbit, 2012; Alpizar et al., 2020; Çeken & Taşkın, 2022; Ginns, 2006; Leacock & Nesbit, 2007; Mayer et al., 2001, 2002, 2003, 2004, 2008; Mayer, 2003, 2008; Scheiter & Eitel, 2015; Weng et al., 2018) and *higher academic success* (Akinbadewa, 2020; Akinbadewa & Sofowora, 2020; Bulut, 2019; Ercan, 2014; Ilhan & Oruç, 2016; Iskandar et al., 2018; Wachyuni & Soedarto Harjono, 2023; Umar & Aziz, 2015). However, not all multimedia principles are perceived to be helpful and applicable across all learning contexts (Ayub et al., 2018). Nevertheless, CTML provides a promising theoretical framework that explores how the strategic integration of multimedia elements can optimize learning experiences (Mayer, 2009).

By aligning the design and usage of OERs with Mayer's CTML, educators and instructional designers can harness the benefits of visual-based information and reduce cognitive load on the learners' end, thereby enhancing the overall effectiveness and suitability of the resources for self-paced, modular distance learning. With the help of well-designed theory-based multimedia resources, interactive activities, and carefully structured self-paced learning opportunities, learners from MOOCs and in other types of distance learning settings will effectively gain the learning outcomes and course objectives with minimal guidance from course instructors and educators.

Statement of the Problem

In this digital (pre-AI) era, there is an imperative need to foster innovation in distance learning. The incorporation of Mayer's Cognitive Theory of Multimedia Learning (CTML) principles into Open Educational Resources (OERs) for a Massive Open Online Course (MOOC) presents local evidence of the potential of multimedia principles towards enriching learning outcomes and tackling the challenges associated with modular text-based modules. Existing studies have predominantly focused on the issues encountered in modular distance learning, the advantages and effectiveness of multimedia principles in reducing cognitive load and achieving learning outcomes, as well as the implementation of OERs in MOOCs. However, there is a noticeable dearth of literature that comprehensively integrates all four subjects within a single study. Consequently, the question of how to effectively design and implement high-quality multimedia OERs in the Philippine context remains a challenge.

Furthermore, there exists a lack of empirical evidence concerning the efficacy of applying Mayer's CTML principles in OERs within the context of MOOCs and distance learning in the Philippines. It is important to recognize that mere access to copious amounts of information and learning materials does not guarantee effective learning. Thus, to optimize learning outcomes, due consideration must be given to well-researched instructional theories and principles that guide the design and delivery of educational materials. Given these circumstances, conducting this research that integrates multimedia design principles into instructional design becomes crucial to achieving learning outcomes and promoting meaningful and impactful distance learning experiences here in the Philippines.

Objectives of the Study

The central objective of this scholarly research is to investigate the impact and efficacy of integrating Richard Mayer's Cognitive Theory of Multimedia Learning in the design and effectiveness of open educational resources (OERs) within a Massive Open Online Course (MOOC) centered on Media and Information Literacy at the University of the Philippines Open University (UPOU). By investigating the benefits, challenges, and learning outcomes associated with these OERs, this study seeks to contribute to the existing body of knowledge regarding effective instructional design practices in the context of open and online learning environments and close the identified research gaps.

Specifically, the primary objectives of this study are threefold:

- To assess to what extent the integration of multimedia principles in OERs and modules can enhance learning outcomes in MOOC delivered in a distance learning set-up;
- To examine if these multimedia principles can effectively alleviate the learners' cognitive load in a MOOC delivered in distance learning set-up; and
- To discover the perceived benefits and challenges associated with the implementation of Multimedia Principles in these OERs within the context of MOOCs delivered in a distance learning set-up.

Research Questions

To achieve the study's objectives, the following research questions will guide the investigation:

1. To what extent do Open Educational Resources (OERs) grounded on Mayer's CTML enhance students' learning outcomes in a Massive Open Online Course (MOOC)?
2. To what extent do the principles of Mayer's CTML Theory of Multimedia Learning help to lessen the cognitive load it takes to learn the topics in a MOOC through the delivery of OERs?
3. From the perspective of course enrollees, what are the perceived benefits and challenges of implementing OERs grounded on Mayer's CTML in a MOOC?

Significance of the Study

This study holds both theoretical and practical significance. Theoretically, it contributes to the field of educational technology and multimedia research by exploring the integration of Mayer's Cognitive Theory of Multimedia Learning into the design and use of OERs for MOOCs. By providing evidence-based insights within the context of open and distance learning, the study enhances our understanding of how multimedia learning principles can optimize the educational experiences of MOOC learners.

Practically, the findings of this research possess instructional value in a way that it informs students, educators, instructional/curriculum designers, multimedia specialists, course developers, and policymakers in their efforts to create high-quality, learner-centered OERs, modules, and MOOCs. Understanding the impact and benefits of OERs grounded in Mayer's theory can lead to the development of more

engaging and effective educational materials in today's digital age, ultimately completion rates of MOOC participants and improving learning outcomes in similar learning settings.

Scope and Limitations

This research study focuses on investigating the application of Mayer's Cognitive Theory of Multimedia Learning in the design and use of Open Educational Resources (OERs) for Massive Open Online Courses (MOOCs) within the distance learning set-up. It specifically examines the effects of OERs grounded in Mayer's Multimedia Principles on the learners' cognitive load and achievement of learning outcomes. Furthermore, it offers novel insights into benefits and challenges that are not mentioned in the existing literature.

Nevertheless, it is important to acknowledge certain limitations. The findings and conclusions of this study may have limited generalizability due to the specific context and sample used. The research is conducted within a specific timeframe, with a selected set of MOOCs and participants, which may not fully represent the diversity of populations. Secondly, the interpretation and analysis of qualitative data are inherently subjective and influenced by the researcher's perspective. However, efforts are made to minimize bias through rigorous data analysis and triangulation of findings, but some level of subjectivity may still exist. Moreover, the effectiveness of OERs grounded in Mayer's theory may be influenced by external factors beyond the scope of this study, such as learners' prior knowledge, motivation, and technological infrastructure. These external factors are not explicitly included within the parameters of the study, but they may still impact learning outcomes and should be considered

when interpreting the results. Moreover, the study is conducted within a specific timeframe (6 weeks), which may limit the depth and breadth of data collected. Long-term effects and changes in learning outcomes over an extended period may not be fully captured. Lastly, the study mostly relies on self-reported data obtained through surveys, which may be subject to respondent biases, such as social desirability or recall errors.

Overview of the Study

This research study consists of five chapters. Chapter 1 sets the context of the study, including the background, problem statement, purpose, research questions, scope and limitations, and significance. Chapter 2 critically examines relevant scholarly works related to MOOCs & OERs, and Mayer's Cognitive Theory of Multimedia Learning. It synthesizes existing research findings, identifies gaps in the literature, and establishes the theoretical foundation for the study. Chapter 3 expounds on the phases of the research project and describes the participants, data collection methods, and data analysis procedures employed in the study. Chapter 4 presents, analyzes and interprets the empirical data (quantitative and qualitative) obtained from the survey instrument. Furthermore, the discussion section interprets the findings in light of the research objectives and theoretical framework of the study. It compares the results with existing literature, identifies implications for practice, and offers insights into the effectiveness of OERs grounded in Mayer's theory. Lastly, Chapter 5 summarizes the main findings, contributions, and future implications of the study. It restates the research objectives and addresses the research questions. Recommendations for practitioners and policymakers are also provided based on the study findings.

II. REVIEW OF RELATED LITERATURE

2.1 MOOC & OERs around the Globe

Massive Open Online Courses (MOOCs) and Open Educational Resources (OERs) have gained significant attention in the field of education due to their potential to enhance access to quality learning experiences. This part of the literature review aims to explore the current state of research on MOOCs and OERs around the globe, examining their impact on educational practices, problems detected, and proposed solutions.

Open Education encompasses the concepts of Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs). There is a growing interest in the literature on how they should be integrated and interpreted. According to the social media analysis of Abeywardena (2014), there is growing interest in MOOC compared to OER, but stakeholders have not yet formed strong opinions on MOOC due to its recent emergence. In contrast, there is an upward trend in positivity toward OER, and neutrality toward OER has decreased over the 12 months after the 2012 Paris OER Declaration. The study of Stracke et al. (2019) emphasizes that having high-quality OER does not suffice to ensure a great learning experience, especially when they lack licensing for reuse and adaptation. In contrast, MOOCs are seen as innovative learning processes and environments that promote both self-regulated and collaborative learning. So, while OERs are focused on content, MOOCs are seen as more exciting and effective ways of learning because they include *both* the content and the process of learning. However, Kopp et al. (2017) argue that MOOCs do not align with the licensing models specified for OERs, suggesting the need for MOOCs

to adopt open licensing models, such as Creative Commons, to be considered OERs. Silveira (2016) proposes combining OERs and MOOCs to create openness-based MOOCs and mutable, remixable OERs. Havemann (2016) highlights the limitations of the OER movement, suggesting a shift towards Open Educational Practices (OEP) that prioritize practice over content. Alevizou (2015) puts forth the tensions between economic freedom and social equity in openness, noting that technological, social, and political processes play a role in shaping the impact of open education on society. In conclusion, while there are debates about the categorization and alignment of MOOCs and OERs, integrating them under the principles of openness can lead to innovative learning experiences and facilitate the transformation of education.

Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs) have gained traction globally, although the progress and challenges vary across countries. The UK has been a pioneer in adopting and supporting OERs, with The Open University leading the way, but strategic rollout and impact assessment remain challenges (Keskin et al., 2018). Scanlon et al. (2014) further report on the experiences of distance learning, OERs, and MOOCs in the UK, discovering both similarities and differences in how these learning opportunities are made available to the masses. One important factor they unearthed is that being open and giving people choices play a crucial role in these learning programs to work well. It helps more people have access to education and choose what works best for them. In Romania, VasIU & Andone (2014) highlight the need for new skills among teachers to integrate MOOCs into blended learning, such as course design, OER and MOOC curation, and collaborative activity evaluation. Dos Santos et al. (2016) report an increase in open education practices in European Higher Education Institutions (HEIs) that encompass

multiple dimensions beyond MOOCs and OERs, including access, content, pedagogy, recognition, collaboration, strategies, technology, quality, and leadership. Margoum et al. (2022) observe the positive impact of MOOCs in Morocco, with diverse participant populations, increased learner numbers, and improved knowledge and preparedness. In Canada, open education initiatives have primarily been driven by individual institutions and provincial entities, with no federal government authority in education matters (Keskin et al., 2018). Japan has embraced OERs and MOOCs, with major universities offering open courses through the Japan Open Course Ware Consortium (Keskin et al., 2018). Similarly, South Korea sees open learning and OERs as crucial for national competitiveness, while Turkey has actively adopted OERs and MOOCs through various initiatives (e.g., *National Courseware Consortium and translation of MIT courses into Turkish*; Keskin et al., 2018). In the USA, there is strong interest in MOOCs, with universities experimenting with the format, but further experimentation and modification are needed (Keskin et al., 2018). In Arab countries, Jemni & Khribi (2017) introduced the ongoing and upcoming initiatives by the Arab League Educational, Cultural and Scientific Organization (ALECSO) that aim to enhance the use of Information and Communication Technology (ICT) in open education. These initiatives involve the creation of a MOOC focused on mobile development, as well as MOOC courses and training materials dedicated to the development and utilization of Open Educational Resources (OER) and MOOCs that are openly available and freely accessible providing opportunities for learning anytime and anywhere. Overall, while progress has been made in integrating OERs and MOOCs in different countries, challenges persist, including the need for skill development among teachers, copyright awareness, quality control, awareness, appropriate literacy, and support from

management (Canbek & Hargis, 2015; Keskin et al., 2018; Shigeta et al., 2017;). However, the adoption of OERs and MOOCs has the potential to transform higher education and provide access to learning opportunities on a global scale.

More challenges on MOOCs have been identified by researchers. Zancanaro & Domingues (2018) highlight the struggles faced by the team behind a particular MOOC, including the *funnel effect*, which refers to the decrease in the number of participants as the course progresses from the initial registration stage to the completion stage. Technical limitations of the platform were also identified, such as difficulties in monitoring feedback in forums, the lack of a virtual keyboard for writing in Portuguese, and the need for adjustments in the configuration of mandatory assessments and the inclusion of subtitles in Portuguese for course videos. Additionally, the need for interaction and dialogue strategies among learners was recognized, leading to the creation of a Facebook group to encourage meaningful dialogue and bridge the gap between participants and teachers. Additionally, Grandl et al. (2018) have observed a notable increase in dropout rates and a decline in user activity within MOOCs. These findings underscore the importance of continuous innovation and adaptation by MOOC providers to cater to the diverse needs of learners. By addressing these challenges and focusing on creating engaging, inclusive, and supportive learning environments, MOOCs can truly fulfill their promise of democratizing education and enabling lifelong learning for individuals worldwide. Through ongoing research, collaboration, and improvement, the potential impact of MOOCs on global education can be maximized, ultimately shaping a more accessible and inclusive future of learning.

Several researchers explore possible solutions to enhance the use and effectiveness of Open Educational Resources (OERs) and Massive Open Online Courses (MOOCs). Mena et al. (2016) emphasize the importance of teacher training programs in digital competence to prepare educators for regular OER use in the classroom. Likewise, Tsabedzea (2021) stresses the necessity of capacity-building and local programs to develop skills in designing open and blended learning education courses. Alario-Hoyos (2017) highlights the need for improvement in time management skills among learners in MOOCs and making the materials more stimulating and challenging. Karunanayaka et al. (2018) discuss the design of Continuing Professional Development MOOCs to promote the adoption of OERs and OEP, focusing on team leaders, group discussions, and learning scenarios. Daradoumis et al. (2013) explore the use of agent-based frameworks and learning analytics to improve the design, delivery, and assessment of MOOCs. Hajri et al. (2019) present their MOOC-based OER recommender system, MORS, to offer personalized learning resources based on learner profiles and the MOOC profile. Similarly, Piedra et al. (2014) propose an OER recommender based on Semantic Web (Linked Data) technologies and discovered the potential of an interoperable and integrated system for sharing, connecting and discovering data and metadata of OER, allowing its widespread re-use and adaptation in MOOC contexts. Lastly, Holotescu et al. (2014) propose an open European language network/portal to increase the visibility and validation of open resources in EU languages and combat linguistic and cultural hegemonies. These proposed and tested interventions demonstrate the effort of scholars and researchers to enhance the use, accessibility, and effectiveness of

OERs and MOOCs. They have a high potential to further improve the practices in open education.

2.2 MOOC & OERs – the UPOU Experience

In 2013, the University of the Philippines Open University (UPOU), as the pioneer of distance learning and MOOCs in the Philippines, began to dive into MOOCs with its first-ever offering called, "Introduction to Mobile Application Development Using Android Platform." Its primary objective was to provide students with the essential skills and knowledge required for deploying applications on Android phones and tablets (Manalo, 2013 as cited in Gervacio, 2015). Building on this initial success, UPOU continued to develop and offer MOOCs on various topics, collaborating with local and international partners (UPOU, 2020). These MOOCs covered a wide range of subjects, including environmental management, information technology, entrepreneurship, public administration, and teacher education. A decade later, hundreds of UPOU's MOOCs have been offered and they have garnered recognition from the Commission on Higher Education (CHED). Moreover, they have been featured in media publications as well as social media platforms (Villanueva, 2023).

UPOU MOOCs' commitment to "openness" is demonstrated through its utilization of open educational resources (OER) alongside the modular distance learning approach. Additionally, UPOU strives to create its OERs and employs open-access software in its learning management system (LMS) and other integrated applications (Peña-Bandelaria, 2013; Romualdo, 2017). To deliver the MOOCs, [UPOU utilizes MODeL \(Massive Open Distance e-Learning\)](#), a Learning Management System (LMS) based on Moodle, providing a robust and user-friendly platform for

learners to access course materials, engage in interactive activities, and collaborate with fellow participants.

Few studies conducted within the UPOU context have examined the impact of Open Educational Resources (OER) on its faculty and students. According to Bonito et al. (2018), the university has been actively promoting the use of OER since 2011. The use of OER was found to be cost-effective compared to non-OER materials in terms of both cost and quality. Students at UPOU are aware of and utilize OERs, but they lack knowledge about OER licenses, development processes, and where to find them. Nevertheless, students have effectively integrated OERs into a majority of their course-related engagements and self-directed learning endeavors (Arcebucho, 2022). Overall, demonstrates the university's continuous exploration of the potential of MOOCs and OERs to provide quality education to a wider audience, leading the ongoing discourse on these innovative educational approaches.

As UPOU's course materials have evolved, they have transitioned from traditional print materials to multimedia resources and further advanced to incorporate hypermedia components (Romualdo, 2017). Therefore, Multimedia plays a significant role in the context of OERs and online learning at the University of the Philippines Open University (UPOU). Several studies highlight the use of various multimedia learning resources in the course materials and MOOCs offered by UPOU, such as videos, images, academic publications, webpages, slide presentations, podcasts, and games (Bonito et al., 2018; Gervacio, 2015; The Philippine Star, 2013; Villamejor-Mendoza, 2013; Arcebucho, 2022). It is also important to note that these multimedia OERs (video-based, audio-based, and text-based) are publicly available on an online

platform called [UPOU Networks](#). These multimedia resources enhance the learning experience by providing visual and interactive content, catering to different learning styles, and promoting engagement and knowledge retention. They contribute to the accessibility and flexibility of OERs, allowing learners to study at their own pace and providing a wider network of knowledge that is free to access. The integration of multimedia elements in UPOU's courses supports its mission to democratize access to quality education and create an inclusive and engaging learning environment.

2.3 Multimedia Principles

In 1997, Richard Mayer, an American educational psychologist and professor, Mayer (1997) coined the term "multimedia learning" (Lia, Antonenko, & Wang, 2019) and provided a precise definition – the process of constructing a mental model by engaging with instructional material that integrates both verbal and visual elements (Mayer, 2005 in Coskun & Cagiltay, 2021). Simply put, multimedia facilitates the intricate learning processes of the human brain (Sorden, 2013). The conception subsequently sparked a surge of research investigations focusing on specific effects, like split attention (Li et al., 2019). Eventually, the influx of studies contributed to the development of the Cognitive Theory of Multimedia Learning (CTML) and its underlying principles in 2001, namely: *coherence principle*, *signaling principle*, *redundancy principle*, *spatial contiguity principle*, *temporal contiguity principle*, *segmenting principle*, *pre-training principle*, *modality principle*, *personalization principle*, *voice principle*, *image principle*, and *multimedia principle* (Cambridge Press, 2001).

The bibliometric analysis of Li et al. (2019) provided a bird's eye view of the trends and direction of peer-reviewed multimedia learning research and experimental studies from 1996 up to 2016. Empirical investigations have primarily centered on exploring the theoretical underpinnings of multimedia learning research. These studies have placed particular emphasis on theories related to memory, cognitive load, as well as multimedia representations and principles. Examining the interplay between text and pictures, their combinations, and the application of principles such as contiguity, redundancy, and coherence are also laden with experimental and investigative studies. Key contributions in this area come from the seminal works of Mayer and his colleagues (Mayer, 2008, 2009; Mayer & Moreno, 2010; Sweller, 2010; Sweller et al., 2019; van Merriënboer & Sweller, 2005). However, it is crucial to recognize the impracticability of incorporating all studies ever conducted on multimedia principles into one comprehensive literature review. To ensure a thorough and reliable assessment of the effects of multimedia learning interventions, the preferred approach within the academic community is to conduct systematic reviews and meta-analyses, as suggested by Alexander (2020) and Pigott & Polanin (2020). Systematic reviews are highly regarded for their robustness, as they methodically gather and synthesize all pertinent evidence on a specific subject, employing strategies to minimize bias. Ergo, the studies collated and examined for this specific part of the literature review are exclusively peer-reviewed systematic studies and meta-analyses on the impact of multimedia principles in education. For instance, the meta-meta analysis of Noetel et al. (2021) includes 29 meta-analysis reviews that cover 1,189 studies.

Since CTML underpin these multimedia principles, cognitive load is the most often investigated dependent variable in empirical studies, having multimedia

principles intervention as the dependent variable. Self-reported subjective scales (mental effort and CLTs) and objective tools (e.g., eye-tracking and neuroimaging tools) are utilized to quantify cognitive load. In line with Sweller's (2010) findings regarding the use of neuroimaging methods to measure cognitive load (CL), the meta-analysis study conducted by Mutlu-Bayraktar et al. (2019) corroborates that extraneous cognitive load is the most frequently examined type of cognitive load in individual studies. Their findings state that the inclusion of signalling principle techniques results in a decrease in extraneous cognitive load. This is corroborated and extended by Noetel et al. (2021) in their meta-meta analyses study whose primary objective is to settle divergent results on the impact of multimedia learning principles in the literature. For instance, a specific signalling technique – highlighting crucial information in a learning material – resulted in a modest reduction of extraneous cognitive load (Xie et al., 2017). Moreover, Noetel et al. (2021) reported small yet significant effects of the coherence principle (Sundararajan & Adesope, 2020), personalization principle (Ginns et al., 2013), signalling principle (Xie et al., 2017; Schneider et al., 2018), and contiguity principle (Schroeder & Cenkci, 2018, 2020; Ginns, 2006) as strategies to reduce extraneous cognitive load; and the effectiveness of the modality principle, multimedia principle, segmenting principle and pre-training principle as strategies in better management of intrinsic load. Both intrinsic and extraneous load are decreased by low-to-enthusiastic voice (i.e., voice principle; Liew et al., 2022) By effectively implementing these strategies, attention is directed towards the essential elements of learning while minimizing attention on factors that contribute to extraneous cognitive load. Consequently, these strategies can reduce extraneous cognitive load and optimize the learning process (Noetel et al., 2021).

Pacing or learner control is found to be a moderator of cognitive load. The ability of learners to study the materials on their own time and affordance (self-paced) is a segmenting technique that is proven by studies to be beneficial in managing cognitive load (Çeken & Taşkın, 2022; Rey et al., 2019; Noetel et al., 2021). The literature on multimedia learning has provided evidence that pacing has an impact on learning outcomes as well. Specifically, studies such as Kalyuga et al. (2004 as reported in Alpizar et al., 2020) and Adesope & Nesbit (2012) have shown that learner-paced materials, where individuals have control over the pace of their learning, are more effective compared to system-paced materials. Chen et al. (2021) state that learner control allows learners to actively construct a cohesive mental model during the process of multimedia learning, thereby facilitating and enhancing the overall effectiveness of multimedia learning, but they found no significant difference in cognitive load, mental effort, learning satisfaction and perceived achievement. Moreover, research also indicates that multimedia principles are more advantageous in a system-paced environment compared to self-paced presentations, as learners in self-paced settings lack the ability to navigate forward or backward, revisit missed sections, or pause when experiencing cognitive overload. Studies by Adesope & Nesbit (2011), Noetel et al. (2021), Reinwein (2012), and Rey (2012) support this notion. The current study at hand has self-paced learning materials and aims to weigh on this debate in the subsequent chapters.

The second most crucial dependent variables are learning outcomes and learning performance. Learning outcomes either refer to transfer, retention, and/or comprehension. Studies show that multimedia learning principles, such as signalling segmenting, and spatial contiguity lead to favorable learning outcomes in terms of

higher retention and transfer scores than control groups (Adesope & Nesbit, 2011; Alpizar et al., 2020; Höffler, 2010; Schroeder & Cenkci, 2018; Sundararajan & Adesope, 2020; Mutlu-Bayraktara, 2019; Çeken & Taşkın, 2022; Rey, 2012; Li et al., 2019); and better comprehension performance (Rey, 2012). Furthermore, multiple studies, including those conducted by Kalyuga et al. (1999), Mautone & Mayer (2007), Naumann et al. (2007), and Ozcelik et al. (2010), have demonstrated that when learners are provided with support in the form of signaling or cueing to direct their attention to relevant resources, they exhibit improved learning performance. Xie et al. (2017) confirm this claim and contend that cognitive load and learning outcomes and performance are inversely proportional; that is, lower cognitive load results in higher and better learning. The current study is relatively novel compared to the previous body of literature since it has clearly defined learning outcomes for the course where the research will take place, these outcomes are directly measured through pre-tests and post-tests without having to be converted into retention and transfer tests.

However, more recent studies prove that not all principles are applicable in all learning situations (Çeken & Taşkın, 2022; Fyfield et al., 2022). For instance, the systematic study of Fyfield et al. (2022) on instructional videos reveals that the redundancy and modality principles have shown inconsistency in their effectiveness. On the other hand, the principles of coherence, segmenting, and learner control have demonstrated more consistent and robust effects. The systematic review of Coskun & Cagiltay (2021) reveals that certain reviewed studies, such as those conducted by De Koning et al. (2010) and Kriz & Hegarty (2007), indicated visual cueing does not necessarily lead to improved learning outcomes, despite resulting in longer fixation durations and a higher number of fixations on the relevant parts of an animation. This

disparity suggests that perceiving and attending to the relevant parts of animation does not guarantee an implicit understanding of the information contained in those parts by learners.

A surrounding debate is especially prominent regarding the redundancy principle, which states that redundant material, which has the simultaneous presentation of the same information in multiple forms (e.g., verbatim on-screen text + narration), or unnecessary elaboration, can hinder rather than facilitate learning (Kalyuga & Sweller, 2014). An application of the redundancy principle on material means combining visuals and narration or visuals or text, but not visuals + texts + narration simultaneously. As Çeken & Taşkın (2022) report, although Mayer (2017) conducted 13 studies that all provided support for the positive effect of adherence to the redundancy principle on learning outcomes, they discovered that the application of the redundancy principle did not lead to improved learning outcomes in more than half of the studies reviewed (n=41). The number of studies reporting a positive effect of adhering to the redundancy principle is relatively low, particularly in terms of retention scores (30.8%) and achievement scores (33.3%). Trypke et al., (2023) provide evidence supporting the notion that the strategic use of redundancy, particularly in terms of content redundancy, can be advantageous instead of counterintuitive in facilitating the learning process. Based on the meta-analysis findings of Adesope & Nesbitt (2011), the inclusion of redundant verbal components in spoken-written presentations did not yield significant learning benefits when compared to written-only formats. In contrast, when juxtaposed with spoken-only presentations, the integration of verbally redundant spoken-written content was associated with enhanced learning outcomes. This suggests that the supplementation

of text-to-audio narration proves advantageous, while the addition of audio narration to text does not yield similar advantages. Moreover, text-audio spoken–written redundant materials (e.g., closed captions) might be proven helpful for people with accessibility issues (Adesope & Nesbit, 2005; Wald, 2008) and second language learners. Noetel et al. (2021) argue that verbal redundancy is only likely to have a negative impact in situations of exceptionally poor design, commonly referred to as 'death by PowerPoint.' In these cases, the effort required to establish a connection between speech and written text becomes excessively high, resulting in cognitive overload. Therefore, redundancy is beneficial to multimedia OERs and resources depending on how they are applied. For instance, one of the most significant discoveries of Adesope & Nesbit (2011) in their meta-analytic review reveals that *partial redundancy*, which is writing or flashing key terms alongside spoken narrations yields superior learning outcomes compared to fully redundant spoken-written presentations. A speculated reason why this works is such presentations effectively direct students' attention towards key concepts (e.g., signalling) and facilitate more efficient retrieval and formation of appropriate schemas (Mayer & Johnson, 2008).

Despite the numerous experimental studies from Mayer and colleagues that prove each of the twelve principles to be effective, there exist gaps in the literature which this study aims to fill. First, virtually all experimental studies are held within the traditional learning context withing the Science, Technology, Engineering, and Mathematics (STEM) field, making it uncertain if the multimedia principles can be directly applicable to students in a distance learning environment or those studying non-STEM topics. Secondly, a trend can be observed from the individual studies covered by the meta-analyses research – they primarily cover short-term laboratory

studies with only one to a few materials to view for the experiment and control groups. Third, almost all studies are quantitative. The data analyzed are from subjective self-reported scales and objective scorings and ratings (e.g., eye-tracking data and test scores). A quantitative-qualitative study such as this current study employs is an approach that shall provide more profound insights into students' experiences with multimedia learning materials beyond what numbers can tell. Fourth, despite being a considerably robust theory, there are conflicting results and no consensus on the applicability of multimedia principles of CTML across all learning settings. Fifth, not all multimedia principles are given equal scholarly attention in the literature. Some are underresearched, such as voice principle spatial contiguity, temporal contiguity, and pre-training (Çeken & Taşkın, 2022). Therefore, to generate theoretical contributions that are timely and relevant to today's past-faced digital age, it is beneficial and imperative to conduct multimedia learning research that involves a qualitative aspect; covers a real learning set-up with longer instructional treatment and numerous materials; and applies all twelve multimedia principles by Mayer in a single study. Such an approach has the potential to yield new findings that address the surrounding debate and disparate findings regarding multimedia learning, enabling educators and course designers to integrate multimedia effectively in innovative models of learning in today's 21st-century education (e.g., open education, distance learning, online learning, blended learning, flipped learning).

2.4 Multimedia Principles and MOOCs

Massive Open Online Courses (MOOCs) have gained significant popularity as a flexible and accessible form of online education that is generally free of charge. To

enhance the effectiveness of MOOCs, researchers have explored the application of Multimedia Learning Principles, derived from cognitive science, to improve learning outcomes. This review aims to examine the existing literature on the application of these principles in MOOC settings. The key themes identified include the effects of multimedia design on learning performance, the impact of video format and engagement, the importance of motivation, feedback, and the learning community, and the role of cognitive load and instructional design principles. By analyzing these themes, this review provides valuable insights into the potential strategies for optimizing multimedia learning in MOOCs.

Empirical research has shown the effects of multimedia design on learning performance in MOOCs. Zhang (2021) found that displaying subtitles closely to the content improves retention and transfer of knowledge. Palmina & Dario (2017) highlighted the importance of integrating aesthetic elements into learning, promoting engagement and facilitating cognitive processes. Williams (2013) highlighted the benefits of incorporating questions and prompts into online videos to improve memory practice and the application of learned concepts. In connection with the current study, these findings emphasize the significance of multimedia design in enhancing learning outcomes in MOOCs.

Studies focusing on video format and characteristics reveal various factors that contribute to student engagement in MOOCs. De Rosa (2021) found that shorter videos, Talking Head framing, and the use of didactic tools enhance student appreciation and engagement in MOOCs. Similarly, the primary finding gleaned from Kizilcec et al. (2015) is that while a significant majority of learners expressed a

preference for viewing lectures with the presence of the instructor's face (i.e., talking head video), a noteworthy proportion of participants preferred lectures without a visual representation of the instructor's face, hence supporting the image principle. Oakley & Sejnowski (2017) highlighted the importance of effective presentation style, instructional methods, and humor in creating engaging MOOC content, such as lecture videos. Sharma, Dillenbourg, & Giannakos (2019) found that motivation, *with-me-ness* (attention to objects referred to by the instructor in videos), and learning outcomes are interconnected in MOOC video settings. Additionally, Thornton, Riley & Wiltrout (2017) emphasized that concise and informative lecture videos tend to have higher completion rates, indicating their value to learners. These findings underscore that planning, shooting, and editing a learning video in a certain manner have a role to play in encouraging students to actively engage in MOOCs.

The significance of motivation, feedback, and building a learning community in MOOCs is evident in the literature. Zhu (2022) highlighted MOOC instructors' strategies to inspire intrinsic and extrinsic motivation, provide immediate feedback, and create engaging instructions. Some of these motivating strategies are providing supplementary learning resources, employing interactive instructional materials, utilizing concise and simple learning units, and integrating multimedia components. Similarly, Ip et al. (2018) emphasized the value of immersive learning experiences in enhancing motivation and enjoyment, which is linked to favorable learning outcomes. Dona & Gregory (2015) emphasized the importance of a participant-first approach in MOOC design, which increases completion rates and enables easy interaction and collaboration. These findings highlight that by presenting information through multiple modalities concurrently, such as incorporating visual aids, auditory elements, and

interactive components, students are more likely to be engaged and motivated in the learning process. Overall, efforts should be made to construct a supportive and motivational learning context that will optimize the educational value of MOOCs.

Multiple studies have highlighted the significance of considering cognitive load and instructional design principles when developing MOOCs. Chen et al. (2017) propose the application of cognitive load theory principles to enhance learning outcomes. This is upon discovering that people process information presented digitally or as hard copy in the same way, with working memory and long-term memory functioning identically in both cases. In other words, consistent with Mayer's CTML. Fein (2017) contributes empirical evidence on the validity of the multimedia principle not only in learning materials but also in giving feedback on quizzes. They reported that students who had an opportunity to learn visually thru pictures, videos, and audio performed 5.3 times better than those who did not receive multimedia feedback. These findings were consistent across all learners, regardless of age, gender, education level, or English-language ability. Zee et al., (n.d.) stress the importance of employing instructional design principles to minimize cognitive load and optimize learning in MOOCs, such as distributing information across modalities, meaning to say – videos should make use of the spoken word, non-textual visual information, and written word to effectively convey information to learners; avoiding irrelevant or redundant information (i.e., coherence and redundancy principle); making use of attentional cues (i.e., signaling principle); observing the minimal or non-existent spatial and temporal distance between information and its corresponding elements as this helps reduce cognitive load and split-attention effects (i.e., spatial and temporal contiguity); and usage pre-training and segmenting large chunks of information to make it easier for

students to process and understand complex concepts (i.e., pre-training and segmenting principles). However, Ginting et al. (2022) discovered in their study that the quality of the learning materials in MOOC requires improvement in terms of redundancy (e.g. instructional videos often contained captions providing word-for-word translations of dialogue) and pre-training (e.g. complex vocabulary lists might not help participants with low English proficiency). In terms of redundancy, the authors suggest that caution should be exercised. They note that captions or other supplementary elements like animation or text have the potential to become extraneous cognitive load, impeding the learning process (Moreno & Mayer, 2000; Mayer & Moreno, 2010). Nevertheless, the authors highlight that instructors can leverage the caption feature effectively to enhance the learning experience, provided it is used appropriately and in moderation. These findings reinforce the importance of incorporating the cognitive load theory, multimedia principles, and effective instructional strategies into the design of MOOCs.

All things considered; the studies reviewed in this literature review highlight the importance of various factors in optimizing multimedia learning in MOOCs. These factors include multimedia design elements such as subtitles (i.e., verbal redundancy) closely aligned with content, immersive learning experiences, and the integration of aesthetic elements. Furthermore, video format, engagement strategies, motivation, feedback mechanisms, and building a supportive learning community play crucial roles in enhancing learning outcomes. Additionally, considerations of cognitive load and instructional design principles, such as coherence, signaling principles, and the elimination of extraneous information, can improve learning experiences in MOOCs. By taking into account these key themes and findings and making informed decisions

based on how they handle the courses based on empirical research, educators and designers can ease the cognitive load of learners and motivate them to finish the course, which improves the completion rates of MOOCs.

2.5 Role of Emotions and Motivation in Multimedia Learning

According to Lauc et al. (2020), in the past decade, a new phase of multimedia learning research has emerged, including motivation and emotions as moderators that facilitate cognitive learning in the inquiry of multimedia learning (Um et al., 2012; Mayer & Estrella, 2014; Plass et al., 2014; Leutner, 2014; Kim et al., 2014; Heidig et al., 2015; Schneider et al., 2018). This is in support of Moreno's (2006) Cognitive-Affective Theory of Learning with Media (CATLM), which states that emotional and motivational factors are meta-cognitive moderators in multimedia-based learning (Leutner, 2014).

Several experimental and meta-analysis studies have examined the integration of emotional design with multimedia principles in learning materials (Munchow et al., 2017; Brom et al., 2018; Wong et al., 2020; Kumar et al., 2016; Schneider et al., 2016; Leutner, 2014; Chen et al., 2021). Emotional design involves manipulating colors and shapes to evoke positive emotions. For instance, Kumar et al. (2016) conducted an experimental study with undergraduate students, manipulating three learning environments: Positive Design (PosD), Neutral Design (NeuD), and Negative Design (NegD). Surprisingly, the students exposed to the NegD design performed better across all learning outcomes compared to the other designs. This unexpected finding might be attributed to the sample group's characteristics, as polytechnic engineering students, who tend to be mildly introverted, often prefer darker colors. In contrast,

Münchow et al. (2017) randomly assigned 118 undergraduate students to two groups: one exposed to an affectively positive multimedia learning environment with warm colors and rounded shapes, and the other to an affectively neutral environment with achromatic colors and sharp edges. The findings showed that participants in the affectively positive environment outperformed their counterparts in comprehension and transfer tasks, especially when the initial effect was strong. These studies demonstrate that the impact of emotional design on learning outcomes can vary depending on learners' profiles, as seen in the divergent results of Kumar et al. (2016) and Münchow et al. (2017).

Apart from colors, shapes that anthropomorphize human posture are revealed to have impacts on human emotions (Lee et al., 2018). Thus, anthropomorphism, defined as attributing human-like characteristics to objects and animations, has also emerged as a prominent subject of inquiry in the field of emotional design in multimedia learning (Brom et al., 2018, Wong et al., 2020; Gong et al., 2017; Wang et al., 2022; Uzun & Yıldırım, 2018). A meta-analysis of 33 independent samples with a total of 2924 participants (Brom et al., 2018) revealed significant positive effects on learning outcomes (e.g., retention, comprehension, and transfer) incorporating anthropomorphic faces and pleasant colors as emotional design approaches in multimedia graphics. The strongest effect of these design choices was observed to have the greatest effect on increasing intrinsic motivation. Multimedia learning approaches that elevate motivational states offer promising opportunities for optimizing the learning process (Brom et al., 2018). However, these manipulations did not significantly impact perceptions of learning or effort but did reduce perceptions of difficulty. Overall, the findings suggest that anthropomorphisms and colors serve as

valuable design principles although the researchers stated that they do not strictly align with the concept of emotional design as they primarily target attention-cognitive-memory processes rather than emotions, specifically positive emotion.

The meta-analysis of Wong et al., (2020) encompassing 28 empirical studies on emotional design corroborated the findings of Brom et al. (2018), stating that the integration of emotional designs in multimedia learning, as opposed to neutral designs, yielded notable improvements in a range of learning outcomes, such as retention, transfer, and comprehension. Additionally, these emotional designs exerted a positive influence on intrinsic motivation, liking/enjoyment, mental effort, and positive affect outcomes, and mitigated the perceived difficulty associated with the learning materials. They also stated that the type of emotional design (e.g., anthropomorphic graphics, colors alone) and a combination thereof (e.g., anthropomorphic + colors + audio) are moderators variables to the outcomes, which is confirmed by Gong et al. (2017), stating that the incorporation of anthropomorphic design in isolation did not result in a substantial impact on the emotional responses exhibited by learners. Similarly, the study of Wang et al. (2022) concluded that incorporating multiple emotional design features is more effective for affective and cognitive processes and learning outcomes than using only one in multimedia lessons. Positive emotions exhibit a positive correlation with the gradual intensification of emotional design features in the materials. For instance, Anthropomorphic Design and Sound Effects (ADSE) are proven superior to materials that incorporate colorful designs alone in terms of decreasing cognitive load (Uzun & Yıldırım, 2018). Consequently, instructional designers must recognize that different emotional design approaches

yield varying effects, requiring thoughtful evaluation of the pros and cons inherent in each approach which they should consider in their decision-making process.

One specific category of anthropomorphism in emotional design is the use of **Pedagogical Agents (PAs)**. “Pedagogical agents are on-screen characters that facilitate instruction” (Schroeder et al., 2013, p.1). They can be distinguished as animated characters (human and non-human) or actual humans (Davis, 2018; Wang et al. 2022; Heidig & Clarebout, 2011). Virtual and animated agents are more effective than human agents (Wang et al., 2022). Social cues incorporated in these characters (e.g., gestures, enthusiasm, facial expression, body movements, and voice) are moderating factors of the effects of pedagogical agents on learners (Castro-Alonso et al. 2021; Liew et al., 2017; Wang et. al, 2022; Davis, 2018; Schroeder et al., 2013). Empirical evidence of meta-analysis studies that examine the effects of PAs in multimedia learning materials and environments reveal that: (1) 2D agents have greater efficacy than 3D agents, hence further proving the image coherence principle by Mayer (Castro-Alonso et al. 2021); (2) PA gestures, specifically – deictic gestures that point and guide the learners’ focus on crucial information within a video, have a small yet significant effect on learning outcomes (transfer and retention) and reducing extraneous cognitive load (Davis, 2018; Sharma et al., 2019) thereby supporting the *Signalling Principle* (Mautone & Mayer, 2001); (3) in an online learning setting with high attrition rates like a MOOC, an animated pedagogical agent may help to keep students stay motivated and minimize the drop-out problem (Bendou et al., 2017); (4) the pronounced enthusiasm displayed by pedagogical agents, conveyed through gestures, vocal intonations, facial expressions, and verbal feedback, yielded noteworthy improvements in emotional states, intrinsic motivation, affective

perceptions, and cognitive outcomes of learners (Liew et al., 2017, 2022); (5) Pedagogical agents that employed on-screen text as a means of communication demonstrated a more effective facilitation of learning compared to agents that relied on narration, which violates the modality principle by Mayer (2001) (Schroeder et al., 2013); and (6) Instructional videos showing the instructor's face on-screen had a significant and positive effect on motivation. However, they caused significantly more cognitive load than videos without the instructor's presence, which proves Mayer's image principle to be true (Alemdag, 2022). In opposition, the research conducted by Wang et al. (2022) revealed that the incorporation of affective on-screen pedagogical agents (PA) effectively induced positive emotions in learners, improved intrinsic motivation, and facilitated the learning process, without imposing additional cognitive load as a distracting factor. In conclusion, PAs are found to be beneficial adjuncts to multimedia learning materials, but the extent of impacts and efficacy on the framework of emotions, motivation, and cognitive load may vary depending on the PA's types and characteristics.

To summarize, based on the studies reviewed in this section, emotional design principles and the use of pedagogical agents have the potential to enhance learning outcomes, intrinsic motivation, and affective perceptions in learning with multimedia. However, careful consideration of learners' profiles, individual preferences, design choices, and the specific characteristics of pedagogical agents is necessary to maximize the effectiveness and positive effects. Further research is needed to refine these approaches and advance our understanding of their implications for instructional design, given the dearth of more recent studies on the subject, contrasting views, and

the inherent limitations of the methodologies of the individual studies analyzed in the meta-analyses.

THEORETICAL FRAMEWORK

Cognitive Theory of Multimedia Learning

The Cognitive Theory of Multimedia Mayer (CTML) was formulated by Richard E. Mayer, drawing upon the premises of *Cognitive Load Theory*, which was initially proposed by John Sweller and his colleagues in the 1990s (Sweller, van Merriënboer, & Paas, 1998). Cognitive Load Theory provides a foundation for understanding how the cognitive resources of learners are allocated during the learning process. CTML builds upon this theory and examines how the intervention of multimedia in learning materials and environments can influence cognitive processing and learning outcomes (Mayer, 2005).

CTML posits that effective learning with multimedia involves the active coordination of visual and auditory channels of information processing. Its basic premise is rooted in the *multimedia principle*, stating that people learn better from words and visuals (e.g., graphics, images, diagrams, graphs) than words alone, based on the eleven experimental studies by Mayer (Mayer, 2014). However, not all graphics are considered beneficial, making it crucial to conduct thorough research to formulate principles of multimedia instructional design that truly facilitate the learning process. The multimedia principles emphasize the importance of managing cognitive load and aligning instructional materials with learners' cognitive processes to facilitate

meaningful learning. Overall, CTML provides guidelines for the design and presentation of multimedia materials to optimize learning outcomes.

CTML is based on three core assumptions. First, *dual channel assumption*: learners possess separate channels for processing visual and auditory information (Paivio, 1986). Second, *active processing assumption* – the achievement of meaningful learning is contingent upon learners' deliberate selection of material that is relevant, their systematic organization of this material into a cohesive structure, and their successful integration of it with their pertinent pre-existing knowledge. Lastly, *limited capacity assumption*: according to which, human cognitive processing is subject to limitations, allowing individuals to process only a certain threshold of material within a specific channel one at a time (Baddeley & Logie, 1999). These assumptions form the foundation of CTML and guide the instructional design practices advised by Mayer.

Figure 1 below depicts the mechanism of cognitive processing through a series of arrows, representing distinct stages of information handling. The initial stage, known as *selecting*, involves the transfer of certain incoming images and sounds to the working memory for further processing. Following this, the *organizing stage* arranges the received images into a pictorial model and the accompanying words into a verbal model within the working memory. Lastly, the *integrating stage* establishes connections between these models in the working memory and relevant knowledge (i.e., prior knowledge) retrieved from long-term memory. The entry point for a multimedia message into the cognitive system occurs through the learner's visual and auditory senses, with the top row of the figure denoting the verbal channel (for spoken

words and sounds) and the bottom row representing the visual channel (for graphics and printed words). It is worth noting that within the working memory, printed words can be converted into sounds, and images can be transformed into spoken words (Mayer, 2014).

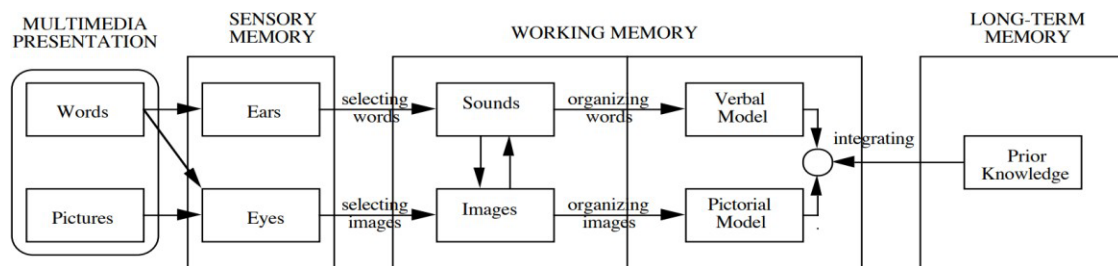


Figure 1: A visualization of Cognitive Theory of Multimedia Learning (Mayer, 2014)

Both The Cognitive Load Theory (Sweller, 2010) and the Cognitive Theory of Multimedia Learning (Mayer, 2014) categorize cognitive load into three types: *intrinsic*, *extraneous*, and *germane*. The degree of cognitive load experienced by learners is influenced by the assemblage and interaction of media modalities and other elements within the learning materials (Sweller, 2010). Intrinsic cognitive load is determined by the inherent complexity of the subject matter concerning learners' pre-existing knowledge. An example of intrinsic cognitive load in the context of media and information literacy can be observed when individuals are learning to critically evaluate online sources for credibility and reliability. This process involves understanding complex concepts such as bias, misinformation, and fact-checking methodologies. The intricate nature of discerning credible information in the digital landscape increases the intrinsic cognitive load for individuals who are only starting to develop media and information literacy skills. Extraneous cognitive load emerges due to external factors that are unrelated to the intrinsic nature of the learning content, such

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as subpar instructional design or a complex learning environment interface. For instance, a micro-learning website with a complex layout, distracting visuals, and inconsistent navigation can impose an additional cognitive burden on learners, diverting their attention away from the main content and hindering their ability to focus on the learning task. In contrast, germane cognitive load, distinct from intrinsic and extraneous cognitive loads, does not rely on the characteristics of the learning material but instead centers on how learners internally allocate their working memory resources to optimize the learning process. Another example of germane cognitive load in Media and Information Literacy (MIL) is when learners exert cognitive effort as they put theory into practice (e.g., using critical thinking skills in accomplishing an assignment).

Concerning these classifications of cognitive load, three types of cognitive processing can occur during multimedia instruction. Firstly, *extraneous processing*: the utilization of limited cognitive processing capacity without contributing to the actual learning process. Secondly, *essential processing*: the selection of pertinent information and its organization in working memory according to the provided structure. Lastly, *generative processing*: the cognitive activity of comprehension by reorganizing it in a coherent structure to the learner's mind and integrating it with relevant prior knowledge. This analysis aligns with the framework proposed in cognitive load theory (Sweller, Ayres, & Kalyuga, 2011) and underscores the necessity for three instructional design objectives: (1) *minimizing extraneous processing* when the extraneous processing in conjunction with required essential processing exceeds the threshold of a learner's cognitive capacity; (2) *regulating essential processing* when essential processing overload the learner's cognitive capacity, and (3) *fostering generative processing* when the learner still has processing capacity but chooses not

to exert the effort in sense-making. These three objectives serve as the foundation for twelve research-based instructional design principles for multimedia learning, which are presented in the accompanying table.

Cognitive Processing	Description	Instructional Goal
Extraneous	<ul style="list-style-type: none"> • Not related to instructional goal • Caused by poor instructional design 	Reduce extraneous processing
Essential	<ul style="list-style-type: none"> • Aimed at representing essential material, • Caused by complexity of material 	Manage essential processing
Generative	<ul style="list-style-type: none"> • Aimed at making sense of essential material • Caused by learner's effort 	Foster generative processing

Table 1: Description of each cognitive process and the instructional goal concerned in CTML, adapted from Mayer (2014)

The subsequent table synthesizes the instructional principles aligned with the tripartite instructional goals of CTML, supplemented with the description of each principle and the respective quantity of experimental studies of Mayer and colleagues yielding positive findings. It also presents the median effect size derived from the meta-analysis of Mayer & Fiorella (2014). An effect size greater than $d = 0.40$ signifies educational significance (Hattie, 2009).

Reducing Extraneous Processing

Principles	Description	Tests	Effect Size	Sample Practical Application
Coherence	Delete extraneous material	22 of 23	0.86	Prune decorative images, slides, animations, and content that are primarily for aesthetic purposes but are not integral to learning the lesson.
Signaling	Highlight essential material	25 of 29	0.41	Use cues or prompts to highlight important information. For example, when explaining key terms related to media literacy, use bold or italicized text, different colors, or icons to draw attention to those terms and indicate their significance.
Redundancy	Don't add onscreen captions to narrated graphics	16 of 16	0.86	Avoid lecture videos in which the voiceover merely reads aloud the slides on screen.
Spatial Contiguity	Place printed words near corresponding part of graphic	22 of 22	1.10	When explaining the different types of information disorders, include labeled diagrams or illustrations alongside the descriptions rather than presenting them separately or far from each other.
Temporal Contiguity	Present spoken words at same time as corresponding graphics	9 of 9	1.22	Align the timing of relevant audio and visual elements. For instance, when showing examples of social media apps, make sure that the voiceover and the related visuals for these apps are synchronous – not one before or after the other.

Managing Essential Processing

Principles	Description	Tests	Effect Size	Sample Practical Application
Segmenting	Break the lesson into learner-paced parts	10 of 10	0.79	Give the learners the ability to play, pause, rewind, and fast-forward a lecture video.

Pre-training	Present characteristics of key concepts before lessons	13 of 16	0.75	Before proceeding with the lesson, provide an introduction part to each module and include a section where key terms about media and information literacy are defined
Modality	Use spoken words rather than printed words [when visuals are presented]	52 of 61	0.76	For instance, when explaining the concepts of media bias, use voiceover narration in explaining the relevant images, diagrams, graphs or graphics on-screen instead of a textual explanation.
<u>Fostering Generative Processing</u>				
Principles	Description	Tests	Effect Size	Sample Practical Application
Personalization	Put words in conversational style rather than formal style	14 of 17	0.79	Use first- and second-person pronouns such as <i>you</i> , <i>we</i> , <i>us</i> , <i>our</i> , and <i>I</i> instead of third-person pronouns.
Voice	Put words in human voice rather than machine voice	4 of 5	0.69	When describing the state of Philippine media, use a lively and enthusiastic human voice to capture the learners' interest and maintain their engagement.
Embodiment	Have onscreen agent use human-like gestures and movements	11 of 11	0.36	Use animated characters and animated humans in a video about digital citizenship.
Image	Do not necessarily put static images of agent on the screen	9 of 14	0.20	Do not include the face and body of the instructor in a lecture video to avoid distractions. Rely on graphics, text, and narration instead.

Table 2: Summary of multimedia principles under each cognitive process. Descriptions are lifted from Mayer (2014). The examples of practical application are

from the current researcher. All of the principles have statistically significant results except the Embodiment and Image principle.

Cognitive-Affective Theory of Learning with Media (CATLM)

As research progresses, the latest advancement in the processing model of multimedia materials, based on the Cognitive Theory of Multimedia Mayer (CTML), incorporates emotional and motivational components. CATLM is an extension of the Cognitive Theory of Multimedia Learning proposed by Richard E. Mayer. It was further developed by Richard E. Mayer and Roxana Moreno in the early 2000s (Moreno, 2006; Moreno and Mayer, 2007). CATLM combines cognitive and affective elements in the context of multimedia research (Chen et al., 2021).

Research on emotions supports the view that: (a) *emotions are present in various contexts and are pervasive in human experience*; (b) *emotions are inherently intertwined with cognitive processes, influencing how we think, perceive, and remember information*; (c) *the connections between emotions and cognition have a strong motivational impact on individuals*. These three dimensions of emotions have significant implications for theoretical models of multimedia learning and the design of instructional materials and methods (Chen et al., 2021). Furthermore, in their study, Plass & Kalyuga (2019) identified four key ways in which emotions are connected to cognitive load theory: (a) *emotions can serve as a source of extraneous cognitive load*; (b) *emotions can impact memory processes*; (c) *emotions can contribute to intrinsic cognitive load*; and (d) *emotions can influence motivation, leading to increased cognitive effort*. Therefore, to attain a comprehensive understanding of cognitive

processes, several researchers take into account affective factors in learning, which encompass feelings and emotional experiences.

Wong & Adesope (2020) reports the assumptions of Cognitive-Affective Theory of Learning with Media (CATLM), which include: (a) *separate channels exist for processing visual and auditory information* (Paivio, 1986; Baddeley, 1992); (b) *each channel has a limited capacity for processing information simultaneously* (Baddeley, 1992); (c) *meaningful learning occurs when learners actively engage in selecting, organizing, and integrating incoming information with prior knowledge to create coherent mental representations* (Mayer, 2014; Wittrock, 1989); (d) *learning is influenced by motivational factors that affect learners' cognitive engagement levels* (Pintrich, 2003); (e) *metacognitive strategies play a role in regulating cognitive and affective processes during learning* (Moreno & Mayer, 2007); (f) *individual differences impact the efficiency of learning with various methods and media* (Park et al., 2014).

Similar to CTML, CATLM recognizes that learning involves three cognitive processes: *selection, organization, and integration* (Mayer, 2014), the primary distinction lies in its assumption that learners' motivation, affect, and metacognitive skills can influence any of these cognitive processes at any given point (Moreno & Mayer, 2007).

The CATLM provides a theoretical foundation for investigating how visually appealing elements, in conjunction with learners' motivation and affect, regulate cognitive learning processes. Overall, it supports the *emotion-as-facilitator-of-learning* hypothesis, stating that positive emotions enhance learning by increasing motivation,

leading to improved generative processing and learning performance (Um et al., 2012; Mega et al., 2014; Pekrun, 2006, as cited in Wong & Adesope, 2020).

While the current study is primarily anchored on the Cognitive Theory of Multimedia Learning, it is important to acknowledge that the premises and assumptions of the Cognitive-Affective Theory of Learning with Media (CATLM) can potentially provide valuable insights into the findings of this research. By considering the tenets of CATLM, we can gain a deeper understanding of the potential benefits and challenges associated with multimedia learning beyond the scope of the Cognitive Theory of Multimedia Learning alone.

III. METHODOLOGY

This chapter provides a comprehensive overview of the various stages encompassing the completion of the project. It delves into extensive details regarding the research design employed, the participants involved in the survey, data gathering techniques, and the subsequent data analysis procedures. This chapter serves as a testament to the meticulous planning and execution of the study, ensuring the reliability and validity of the research outcomes.

3.1 Project Phases: Implementation Stage

Phase 1: Drafting of Modules

The modules serve as the backbone of the Massive Open Online Course (MOOC) about Media and Information Literacy. These modules are designed to cover specific topics or learning objectives and provide a structured framework for the course content. In this part of the project, Ms. Yrelle Mae Lleva, university extension associate of the FICS, served as a co-author of the modules.

The drafting process involves carefully outlining the key concepts, formulating learning outcomes and aligning them with the module content, researching, organizing the content in a logical sequence, and incorporating relevant instructional materials and resources.

	Objective 1: Appreciate the importance of MIL in today's information society and apply in your everyday life	Objective 2: Gather the right type of information for your needs	Objective 3: Assess the credibility, reliability, and accuracy of the information you consume	Objective 4: Create and share media and information lawfully, ethically, and aesthetically
Module 1				
Define MIL and its related concepts in your own words.				
Explain the relationship of information to data, knowledge, and wisdom.				
Describe the contemporary Philippine media landscape and the current issues it faces.				
Examine how media literacy, information literacy, and technology literacy both differ and relate to one another				
Module 2				
Differentiate between an influencer and a journalist				
Identify the different types of information disorder				
Enumerate the types of disinformation.				
Discuss how to call out family members who share false information on social media.				
Module 3				
Identify the selection criteria in assessing information				
Analyze each information source by asking the right questions				
Filter information in terms reliability, credibility, and accuracy				
Decide for your yourself which information sources are the best and most suitable for your needs				
Module 4				
Define responsible digital citizenship				
Determine ways on how to fact-check				
Reflect the ways that you can protect yourself online.				
Enumerate various factors that affect the media and information we consume.				
Module 5				
Identify the process behind the creation and sharing of information				
Enumerate Philippine Laws that regulate free speech				
Determine visual design principles and elements				
Design a media product integrating all the principles learned from the course				

Figure 2: Alignment of Learning Outcomes to the Course Objectives

Ms. Yrelle Mae Lleva was in charge of *Module 2: Role of Media and Information Literacy in Social Media and the Internet* and *Module 4: Media and Introduction to Media and Information Literacy Information Literate Individual*, while the researcher took the lead in writing *Module 1: Introduction to Media and Information Literacy* and *Module 3: Assessing Media and Information Sources*. Both of the authors contributed to *Module 5: Creating and Sharing Media and Information*.

In writing the module, the *Media and Information Literacy Teaching Guide* by Commission on Higher Education (CHED) and Philippine Normal University (PNU) served as the primary reference for the course content.

Below is the course outline, detailing the modules in the course, together with the topics and subtopics included.

Module	Topics	Subtopics
Module 1: Introduction to Media and Information Literacy	A. Media, Information, Technology Literacies	<ul style="list-style-type: none"> • What is Media and Information Literacy? • Five Laws of MIL
	B. Information Literacy	<ul style="list-style-type: none"> • What is Information? Stage/Elements of Information Literacy • Data, Information, Knowledge, and Wisdom
	C. Media Literacy	<ul style="list-style-type: none"> • What is Media? • The Philippine Media Landscape • Types of Media (Print, Broadcast, and New Media)
Module 2: Role of Media and Information Literacy in Social Media and the Internet	A. Social Media and the Internet	<ul style="list-style-type: none"> • Social Media Addiction • What's "Clickbaiting"? • Journalist vs. Influencer
	B. Types of Scams in Text and Email	<ul style="list-style-type: none"> • Romance Scams • Text Scams • Phishing Scams • Lottery Scams • Job Application Scams
	C. Information Disorders	<ul style="list-style-type: none"> • Types of Information Disorders • 7 Types of Misinformation and Disinformation
	D. How to call out a family member who shares fake news on social media?	

<p>Module 3: Assessing Media and Information Sources</p>	<p>A. Selection Criteria in Assessing Information</p> <p>B. Sources of Information</p> <p>C. Alternative Sources</p> <p>D. Red Flags and Green Flags of Information (Infographic)</p> <p>E. Should Wikipedia be trusted as a source of information?</p> <p>F. Characteristics of High-Quality Information</p> <p>G. Skills in Determining Reliability of Information</p> <p>H. Skills in Determining Accuracy of Information</p> <p>I. Content, Author/source, and database Checklist (Infographic)</p>	
<p>Module 4: Media and Information Literate Individual</p>	<p>A. Responsible Digital Citizenship</p>	<ul style="list-style-type: none"> • What does it mean to be a digital-literate individual? (infographic) • How could we be responsible digital citizens?
	<p>B. Individual Factors Affecting our Media and Information Consumption</p>	<ul style="list-style-type: none"> • Political Views • Cultural Beliefs • Personal Values • Ideologies • Biases
	<p>C. Types of Biases</p>	<ul style="list-style-type: none"> • The Confirmation Bias • The Hindsight Bias • The Anchoring Bias • The Actor-Observer Bias • The Halo Effect • The Availability Heuristic • The Misinformation Effect • The False Consensus Effect • The Self-serving Bias

		<ul style="list-style-type: none"> • The Optimism Bias
	D. Five Common Logical Fallacies in the Internet	<ul style="list-style-type: none"> • Ad Hominem • False Dichotomy • Post Hoc, Ergo Propter Hoc • Straw Man • Slippery Slope
Module 5: Creating and Sharing Media and Information	A. Creating and Sharing Information	<ul style="list-style-type: none"> • The Research Process – an overview • Copyright and Creative Commons • Importance of Citation • How to Cite Properly? • Most Common Citation Styles • Freedom of Expression on Social Media and Cyberspaces • Philippine Laws that Regulate Free Speech
	B. Creating and Sharing Media	<ul style="list-style-type: none"> • Media and Information Design Framework • Visual Design Elements • Elements of Design (Infographic) • Visual Design Principles • BONUS: Free and open-source recommended software for creating multimedia materials

Table 3: Course Modules Outline

Phase 2: Designing the Multimedia OERs

Building on the drafted modules, the next phase focuses on the creation of multimedia Open Educational Resources (OERs). The multimedia OERs produced by the researcher for this project are the following:

- 14 Infographics
- Four (4) image carousels
- Two (2) videos
- Five (5) summary decks

[Google Drive Link: Multimedia OERs](#)

In designing the infographics, the researcher utilized **Canva**, an open-source web-based graphic design and video editing program. The branding guidelines are observed and the basic principles of design.

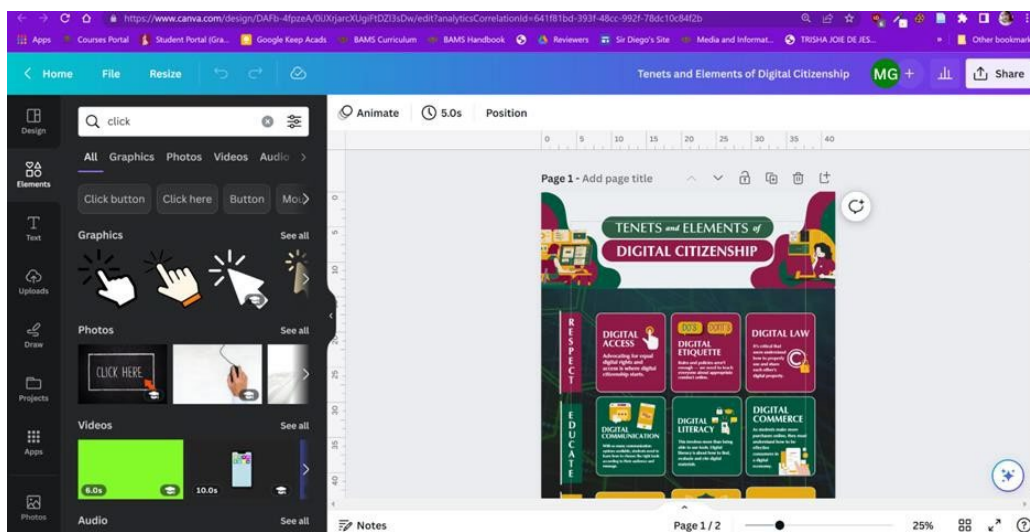


Figure 3: Work in Progress in Canva

Some graphics are also created and modified using **Adobe Illustrator**

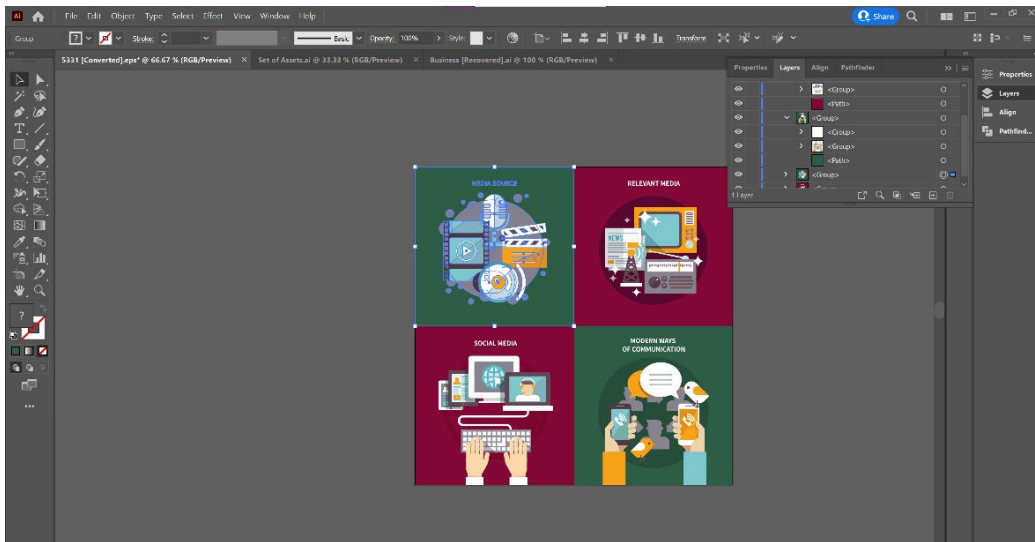


Figure 4: Work in Progress in Adobe Illustrator

a. Videos 1 and 3

- [Video 1: Philippine Mass Media Landscape](#)
- [Video 2: Information Foraging Theory](#)

The first video is mainly edited in **Canva**, while video 2 involving motion graphics is edited in **Adobe After Effects**.

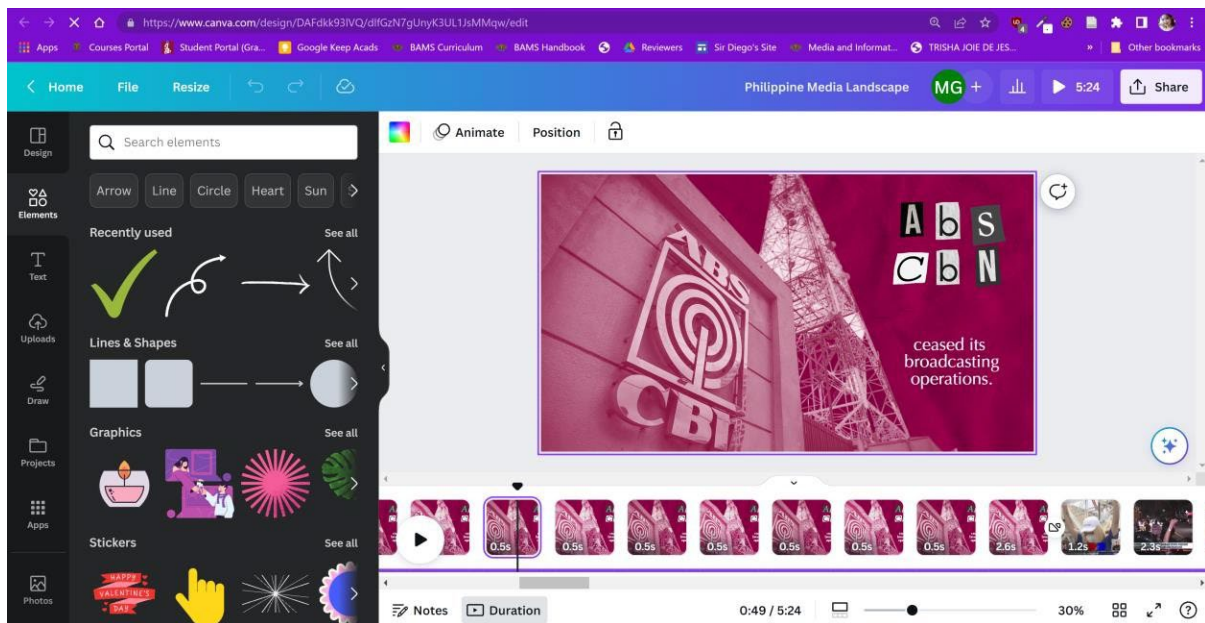


Figure 5: Work in progress on video editing in Canva

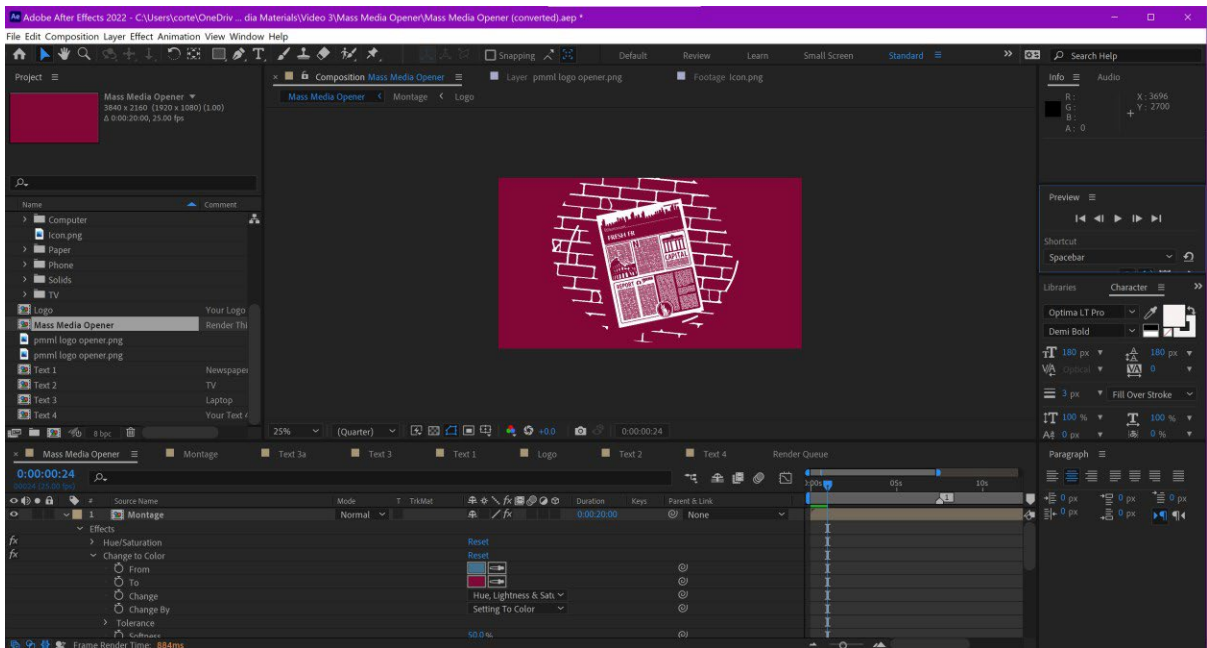


Figure 6: Work in Progress on video editing in Adobe After Effects

The voiceover for the videos is recorded in **Audacity** and post-processed using **Adobe Audition**.

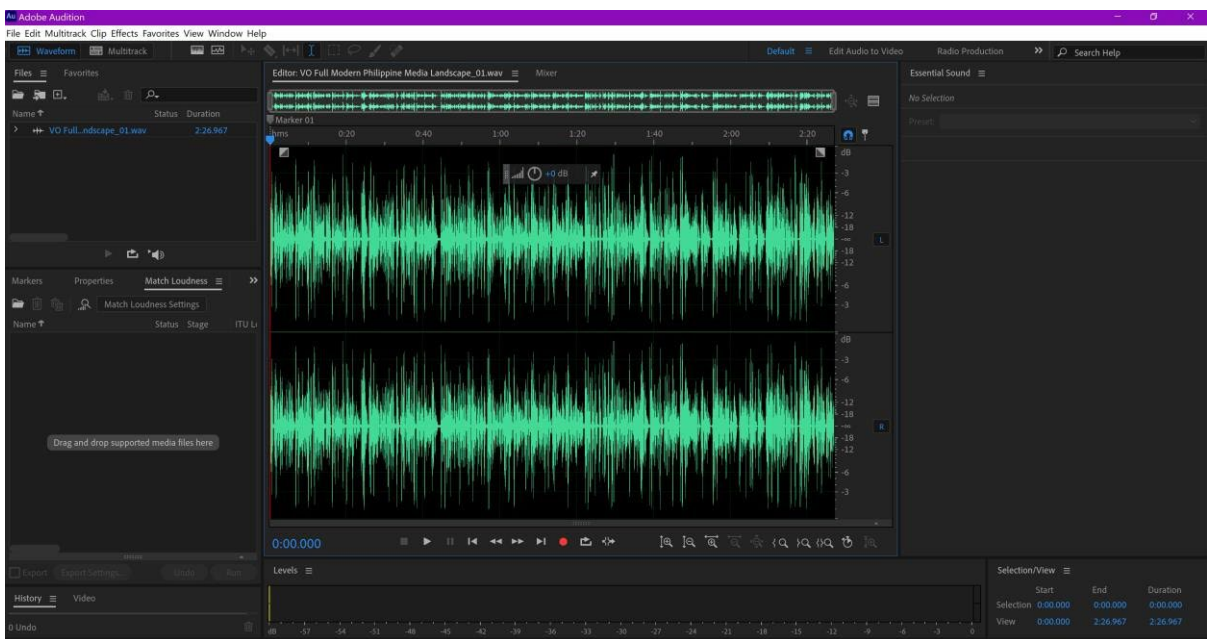


Figure 7: Work in progress on the voiceover in Adobe Audition

b. MIL in Today's Digital World, Course Package in Google Site

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The [course package](#) developed for Media and Information Literacy in Today's Digital World consists of five modules hosted on a Google Site platform. The [study guide](#) has full details of the module components.

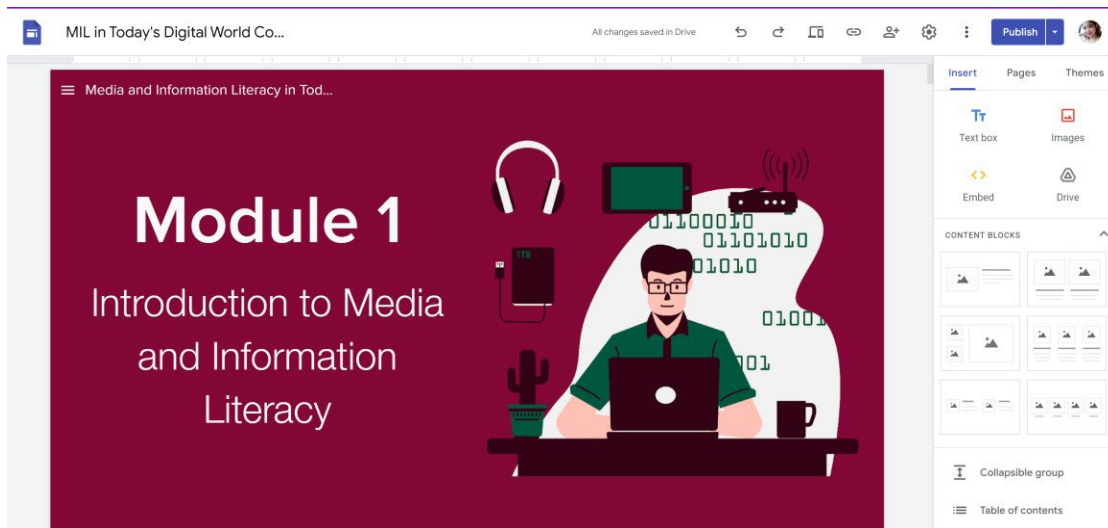


Figure 8: Work in progress of the modules in Google Sites

c. Interactive Summary Slides

The course package incorporates summary slides created using Canva. It provides learners with effective visual summaries that align with Mayer's principles, promoting coherence, signaling, and multimedia learning. These summary slides are strategically designed to be visually appealing, interactive, and concise to achieve learning outcomes and facilitate knowledge retention among course participants. Moreover, serves as valuable learning resources for learners to review, reinforce their understanding, and retain the essential concepts and information presented in each module.

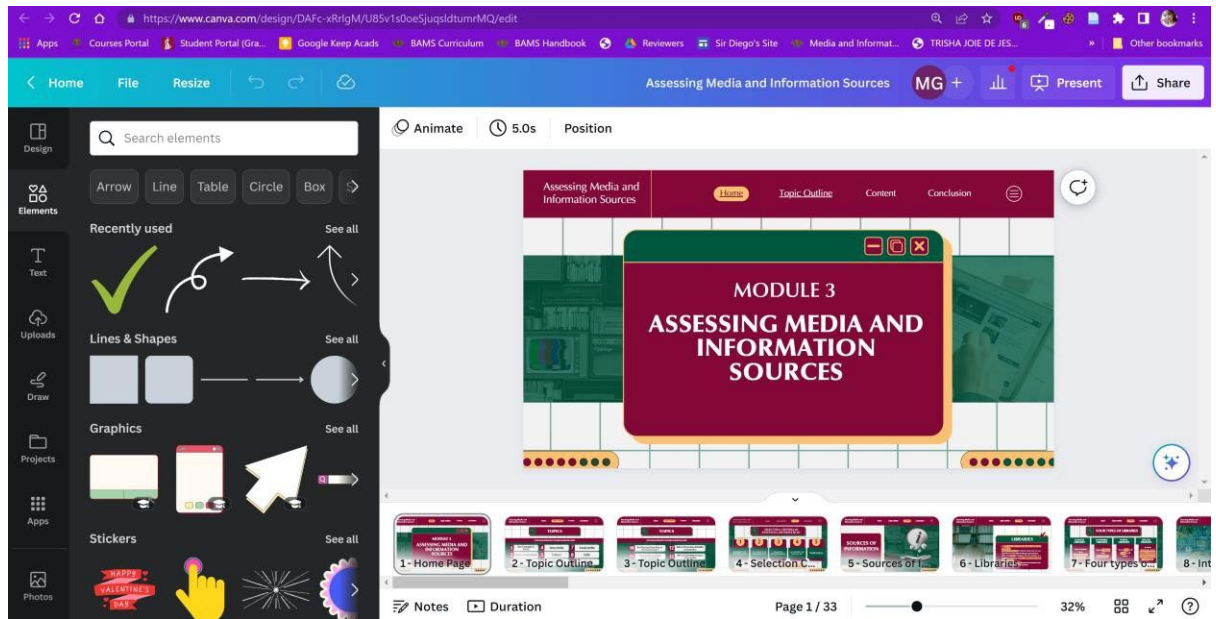


Figure 9: Work in progress on the summary slides in Canva

2.1 Brand Guide

In the design process of multimedia Open Educational Resources (OERs) for the research project, the visual identity and branding standards of the University of the Philippines (UP) served as a primary guide for the researcher. By adhering to these guidelines, multimedia OERs enhance credibility, consistency, and recognition among learners through visual language.

The UP Visual Identity Guidebook 2017 provides comprehensive guidelines and specifications for the use of official logos, colors, typography, and other visual elements that represent the university's identity.

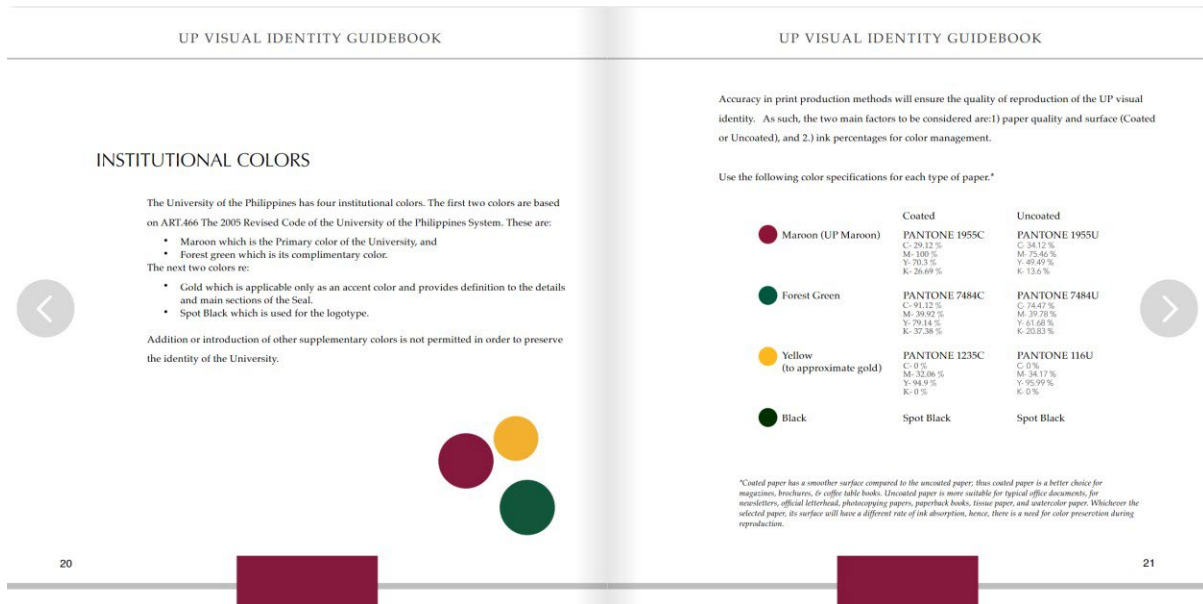


Figure 10: Screenshot from the UP Visual Identity Guidebook 2017. It specifies the institutional colors, and the corresponding Pantone codes.

Source: [UP Media and Public Relations Office](#) (2017)

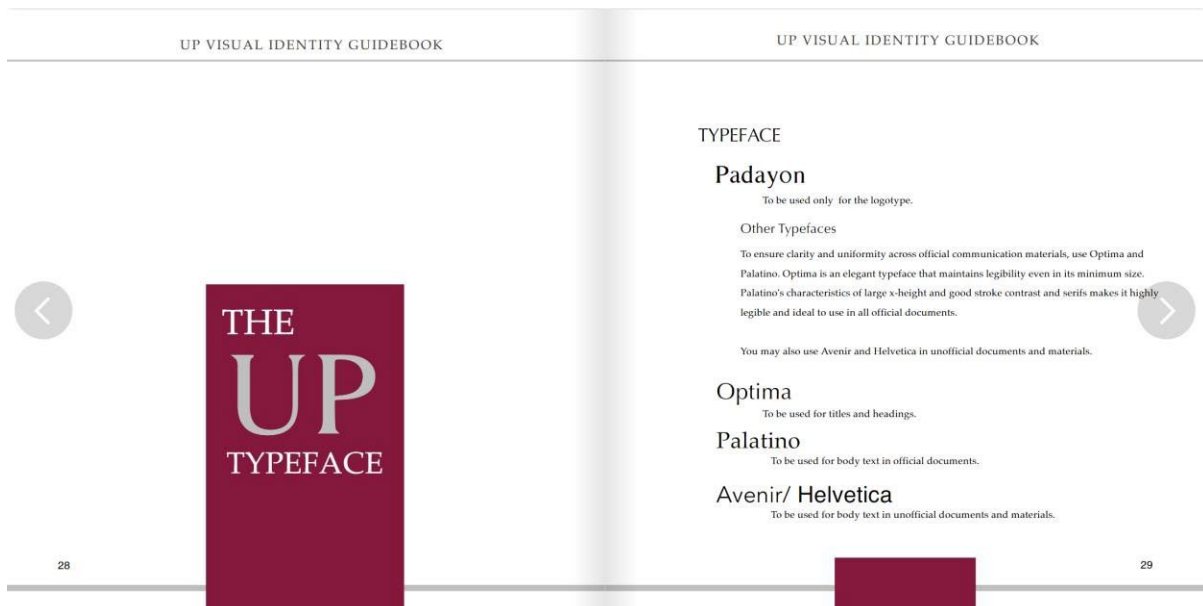


Figure 11: Screenshot of the official UP Typeface from UP Visual Identity Guidebook

Source: [UP Media and Public Relations Office](#) (2017)

As such, in designing the multimedia OERs particular attention was given to the selection of colors and typefaces that align with the university's official branding.

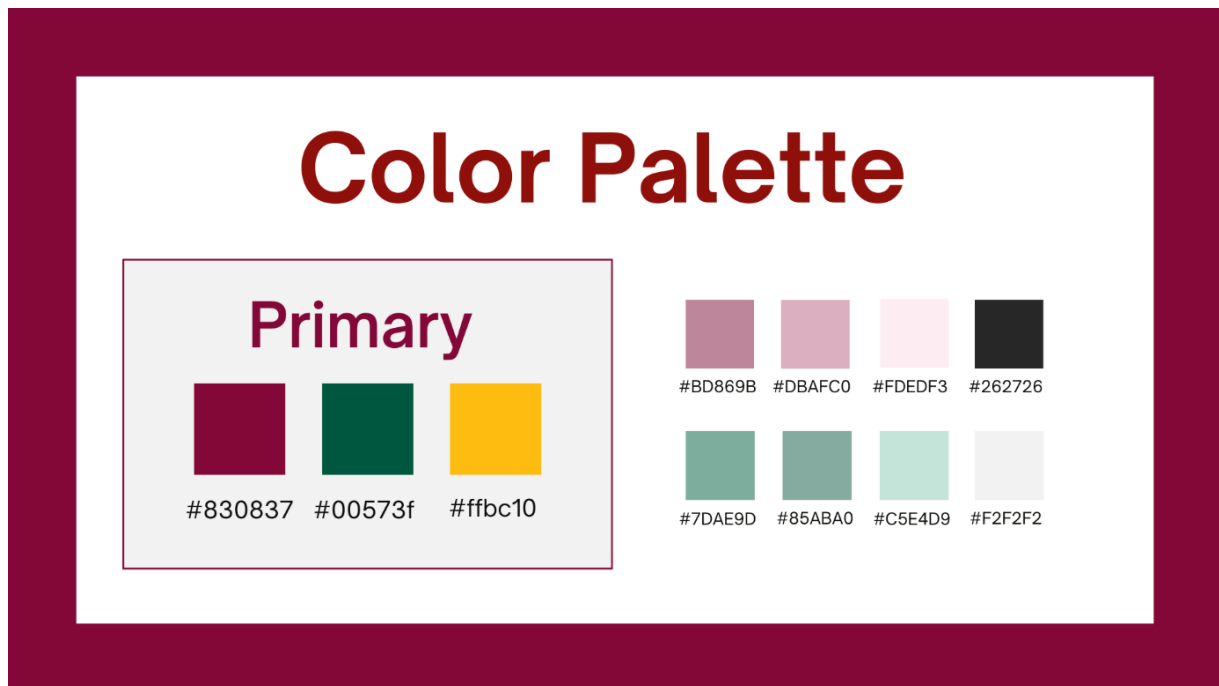


Figure 12: The color palette of the multimedia OERs and course materials

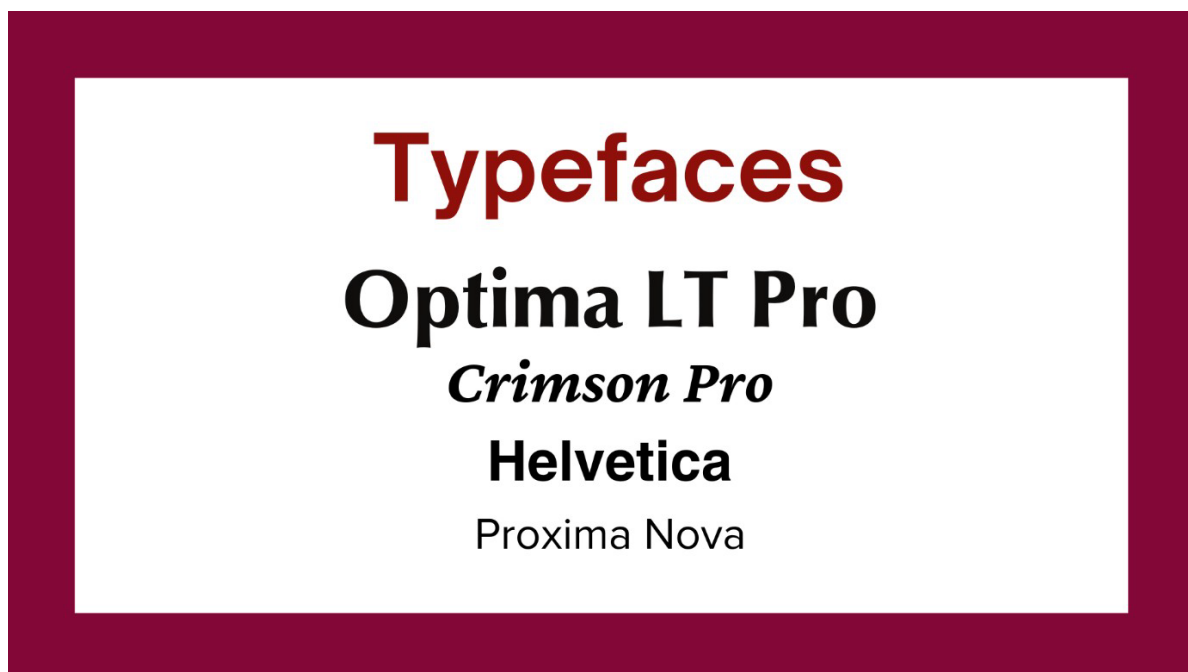


Figure 13: Typefaces used for the project. Optima LT Pro and Crimson Pro are primarily employed in infographics in videos, while Helvetica and Proxima Nova are used in the Google Site Course Package.

3.2 Application of Multimedia Principles

The principles of Mayer's Cognitive Theory of Multimedia Learning are applied during the creation process to enhance the effectiveness of the OERs. These principles guide the development of the OERs, ensuring that they are visually appealing, use appropriate cues and cues for effective learning, and are structured into manageable segments to avoid cognitive overload.

a. Multimedia Principle

The course package, in general, incorporates the multimedia principle by presenting information using a combination of text, graphics, images, and videos. This approach enhances learners' understanding and retention of the material by engaging multiple senses and modalities. Compared to a traditional module, the course package designed for the course makes learning the concepts and topics more manageable and less intimidating to the enrollees by providing illustrations, infographics, and videos alongside the textual content.

5. The Actor-Observer Bias

The actor-observer bias is the tendency to attribute our actions to external influences and other people's actions to internal ones. The way we perceive others and how we attribute their actions hinges on a variety of variables, but it can be heavily influenced by whether we are the actor or the observer in a situation.



6. The False Consensus Effect

The false consensus effect is the tendency of people to overestimate how much other people agree with their own beliefs, behaviors, attitudes, and values.

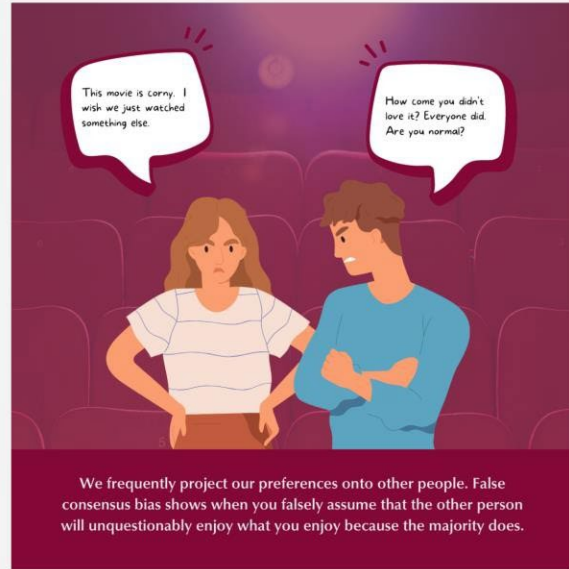


Figure 14: Illustrated examples of Types of Bias in Module 4



2) False Dichotomy

In false dichotomy, the arguer sets up the situation so it looks like there are only two choices. The arguer then eliminates one of the choices, so it seems that we are left with only one option: the one the arguer wanted us to pick in the first place.

Figure 15: Illustrated Example of a Logical Fallacy in Module 4

In Module 4, each type of bias and logical fallacy is accompanied by a graphic, demonstrating real-life manifestations of the bias and fallacy. This is multimedia *Learning in the Digital Age: Implementing Mayer's CTML on Multimedia OERs for a MOOC 61*

principle in action since a photo/image is utilized as a reinforcement to the textual explanation.

Infographics are visual representations of information that combine text, images, and graphical elements to present complex concepts in a concise and visually appealing manner. Incorporating them into the primary course material is an application of multimedia principle, and has the potential to convey complex information in a more accessible and relatable manner, making it easier for learners to grasp and connect with the content (Lankow et al., 2012). Infographics, with their combination of text and visuals, provide a dual-channel presentation of information that taps into both the visual and verbal processing systems of learners. This dual-channel presentation allows for more efficient processing of information and can enhance comprehension and retention (Mayer, 2014), especially among visual learners.



Figure 16: One of the sample infographics in the course – Tenets and Elements of Digital Citizenship.

Moreover, the course package in general highlights important information through signalling, utilizes multimedia elements effectively, incorporates personalization, and employs segmentation. By adhering to Mayer's multimedia principles, the course package optimizes the learning experience for participants.

b. Coherence Principle

To adhere to the Coherence Principle, revisions have been made to the videos. Fluff, or decorative materials, have been reduced to ensure that only the necessary texts and images are included. Simple 2D graphics and flat vectors are utilized instead of highly detailed 3D animated models to provide a streamlined representation of key ideas or concepts, reducing the cognitive load associated with processing visual information. Learners can quickly grasp the main message or relationships depicted in the graphic, allowing them to allocate their cognitive resources more effectively to the essential content.



Figure 17: Revision in Video 1

In *Video 1: Philippine Mass Media Landscape*, a revision was implemented to enhance visual coherence by removing extraneous elements. Specifically, the decision was made to eliminate the text and decorative image in the background, retaining only the logo of Netflix as a focal point. This modification was undertaken based on the understanding that the voice narration effectively complements the visuals, rendering the additional text and decorative image unnecessary.



Figure 18: A frame in Video 2: Information Foraging Theory

In *Video 2: Information Foraging Theory*, simple animated vectors are used as visual representations of the oral description. Complex or intricate visuals can lead to cognitive overload and distract learners from the main message.

c. Signaling Principle

Signaling Principle is heavily implemented in the infographics, videos, and summary decks. The implementation of the Signaling Principle involves the strategic

use of visual cues and design elements to draw attention to important text or key concepts. Infographics are designed with clear and distinct visual elements, such as highlights, to draw attention to keywords. The types of signals used in the materials are geometric cues. Highlighted texts, formatting cues (bold and italics), and color coding. These visual cues effectively guide learners' focus and help them identify and comprehend the most relevant content within the graphics.

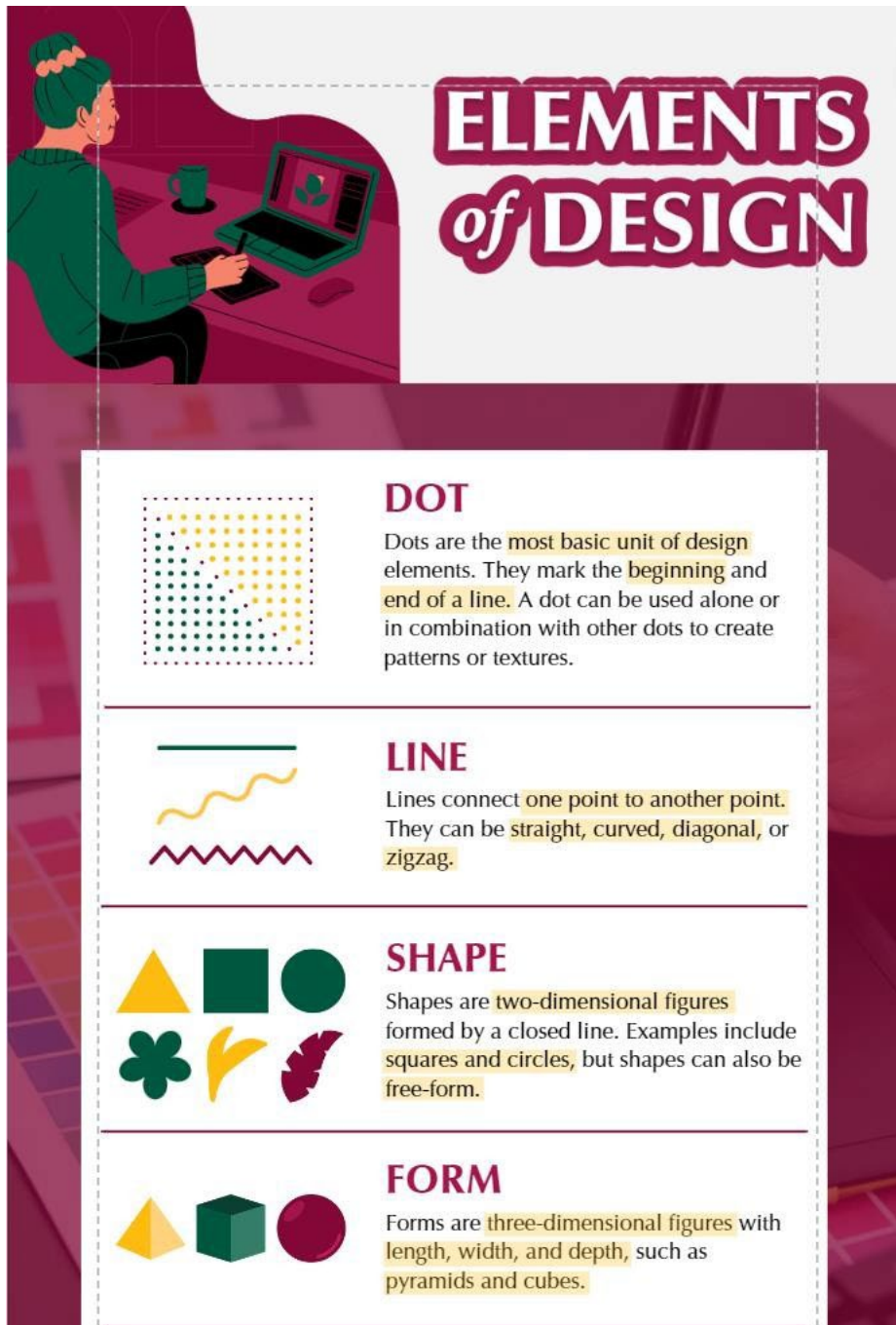


Figure 19: Sample Infographic, using the Signaling Principle. Keywords are highlighted in the definition of the Elements of Design.

The slide features a navigation bar at the top with the following items: "Assessing Media and Information Sources", "Home", "Topic Outline", "Content" (highlighted in a yellow pill), "Conclusion", and a hamburger menu icon. The main content area is divided into two sections. On the left is a photograph of a person with long dark hair, seen from behind, standing in a library aisle with bookshelves. On the right is a dark green rounded rectangle with a yellow border and a red arrow pointing to the title "LIBRARIES". Below the title is a list of four bullet points, each with a yellow highlight box around a key term:

- The first go-to source of information prior to digital and internet age.
- Requires a library card to borrow books that you can take home or read within the library's spaces for free.
- Often have digital counterparts that also function as a database or repository of peer-reviewed journals, thesis, and dissertations.
- ISSN or or ISBN registration ensures that standards were followed in producing these materials.

Figure 20: A sample summary slide. It applies the signaling principle by highlighting and introducing the sections in the navigation bar. Moreover, keywords are highlighted pertinent to the topic.

The image shows a laptop screen displaying a news article from GMA News Online. The article title is "Marcos wants 83 maritime schools reevaluated in 2 years". The author is "By GISELLE OMBAY, GMA Integrated News" and it was published on "April 16, 2023 10:34am". A large green arrow points from the author's name to the title. The GMA News Online logo is visible at the top right of the screen. The entire scene is set against a dark red background.

Figure 21: A worked example in Module 3 demonstrating geometric signalling cues

In one of the graphics in Module 3, arrows and markings are used to direct the learners' eyes to the specific information being explicated.



Figure 22: A frame from Video 1 illustrating the spotlight effect and animated cues

In Video 1: Philippine Mass Media Landscape, the important information showing statistics about the Philippines relative to other countries has an animated circle and is highlighted. It makes use of the *spotlight effect*, which signals to the important information by darkening or blurring the irrelevant information.

A. Selection Criteria in Assessing Information

As introduced by the motivational activity, the following criteria should be used in assessing the information you found online relative to its source (CHED & PNU, 2016).

- **Reliability of Information**
- **Accuracy of information**
- **Value of information**
- **Authority of the source**
- **Timeliness**

Explore the image carousel on the right to know more about each criteria!

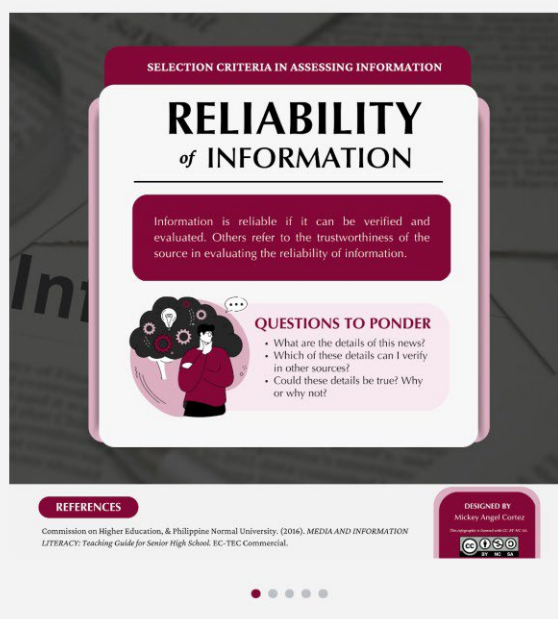


Figure 23: Screenshot of Module 3 illustrating signaling principle

Figure 23 demonstrates the application of the signaling principle by using explicit cues to highlight important information, such as headings and bold text. Moreover, it provides clear instructions on how to navigate the supplemental images.

d. Redundancy Principle

The adherence to the redundancy principle is evident in the videos created for the course, where only the narration and relevant images are included with minimal text. This approach avoids redundancy by minimizing the duplication of information presented in both visual and auditory formats. The use of narration as the primary mode of information delivery in the videos capitalizes on the auditory channel, which is particularly effective for presenting complex or abstract ideas. By utilizing spoken explanations, the videos tap into learners' auditory processing capabilities and

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leverage their ability to process and interpret spoken language. On the other hand, the inclusion of relevant images alongside the narration serves to support and enhance the understanding of the content. These visual elements are carefully selected to illustrate and reinforce the concepts being discussed in the narration. By providing visual representations that align with the spoken information, the videos leverage the power of dual-channel processing, where learners can simultaneously process and integrate information from both visual and auditory modalities. However, closed captioning is also available in case the learners prefer to see the spoken words on a screen as they watch.

e. Spatial Contiguity Principle

In the course materials, the spatial contiguity principle is implemented by aligning relevant words and visuals close to each other. This spatial integration allows learners to simultaneously process verbal and visual information, facilitating their cognitive connections and aiding in the construction of mental representations.

For instance, in infographics, textual explanations are strategically positioned near the associated images or diagrams. This spatial arrangement ensures that learners can easily link the written descriptions with the visual representations, enabling them to form a coherent mental model of the concepts being presented.

Similarly, in the videos, the spatial contiguity principle is applied. As the narrator discusses specific ideas or concepts, corresponding images, animations, or textual cues are displayed near the spoken content. This spatial integration strengthens the association between verbal and visual information, enabling learners to seamlessly process and integrate both modalities.

Sample Revision



Figure 24: Sample Revision of Video 1

In adherence to the spatial contiguity principle, a part of Video 1: Philippine Mass Media Landscape is revised. The accompanying description is close to the referenced statistics to lessen the learners' eye travel duration.

f. Temporal Contiguity Principle

In the course materials, the temporal contiguity principle is applied by synchronizing the delivery of spoken content with relevant on-screen visuals. Videos and animations are carefully edited to ensure that verbal explanations, texts, and corresponding visual elements are presented concurrently, minimizing temporal gaps between them. This temporal contiguity allows learners to process both verbal and visual information simultaneously, facilitating the integration of these modalities and supporting the construction of mental representations.

Additionally, the animation of graphics in the course materials plays a crucial role in applying the principle. By animating the visual elements in a coherent and synchronized manner, the videos ensure that learners can follow the progression of events or changes over time, aligning with the accompanying verbal explanations.

g. Segmenting Principle

The module applies the segmenting principle by breaking down complex topics into manageable segments. A well-segmented, interactive topic outline is employed in the modules, allowing learners to process information in smaller, more digestible units. Furthermore, all of the course materials are specifically designed for self-study and thus are self-paced.



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Figure 25: Interactive Topic Outline in Google Site

Timestamps:

- 0:00-0:20 - Our Information-seeking behavior
- 0:21-1:02 - Information-foraging Theory
- 1:03-1:26 - Informavores
- 1:27-2:21 - Principle of Least Effort
- 2:22-2:44 - Calvin N. Mooers
- 2:45-2:58 - Human Tendencies
- 2:59-3:21 - Disinfodemic
- 3:22-3:42 - How to fight the disinfodemic?
- 3:43-4:35 - How to be a wiser and better media and information consumer and producer?

Chapters View all

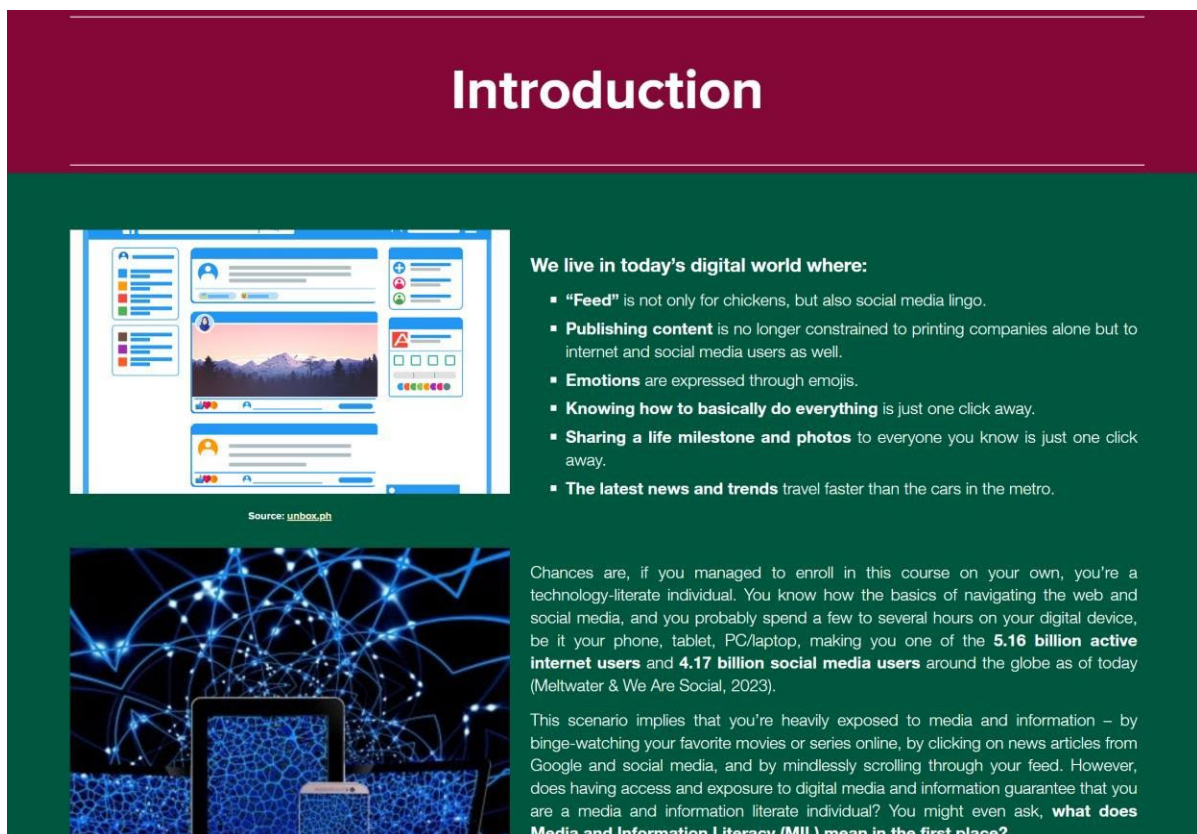
0:00	0:21	1:03	1:27	2:22
Our Information-seeking behavior	Information-foraging Theory	Informavores	Principle of Least Effort	Calvin N. Mooers

Figure 26: Timestamps in Video 2: Information Foraging Theory

On YouTube, where the videos are hosted, it is possible to create **timestamps**, which automatically divide the videos into *chapters*. By incorporating timestamps in the videos, they align with the segmenting principle of CTML. The clear division of content into well-structured manageable segments promotes effective learning by enabling learners to identify and comprehend discrete units of information. Secondly, they can easily locate and revisit specific segments of interest without having to watch the entire video. This flexibility promotes self-directed learning and supports learners in reviewing or focusing on particular concepts or topics. Lastly, learners can anticipate transitions between segments and mentally organize the information accordingly. This cognitive preparation enhances learning by providing learners with a clear mental framework for processing and integrating the presented material.

h. Pre-training Principle

Firstly, at the beginning of each module, there is an introductory segment (i.e., Introduction) that provides an overview of the topic and establishes the context for learning. This pre-training section helps activate learners' prior knowledge, making connections to what they already know and setting the stage for the subsequent instructional content.



Introduction

We live in today's digital world where:

- **"Feed"** is not only for chickens, but also social media lingo.
- **Publishing content** is no longer constrained to printing companies alone but to internet and social media users as well.
- **Emotions** are expressed through emojis.
- **Knowing how to basically do everything** is just one click away.
- **Sharing a life milestone and photos** to everyone you know is just one click away.
- **The latest news and trends** travel faster than the cars in the metro.

Source: [unbox.ph](#)

Chances are, if you managed to enroll in this course on your own, you're a technology-literate individual. You know how the basics of navigating the web and social media, and you probably spend a few to several hours on your digital device, be it your phone, tablet, PC/laptop, making you one of the **5.16 billion active internet users** and **4.17 billion social media users** around the globe as of today (Meltwater & We Are Social, 2023).

This scenario implies that you're heavily exposed to media and information – by binge-watching your favorite movies or series online, by clicking on news articles from Google and social media, and by mindlessly scrolling through your feed. However, does having access and exposure to digital media and information guarantee that you are a media and information literate individual? You might even ask, **what does Media and Information Literacy (MIL) mean in the first place?**

Figure 27: Sample Introduction part of the Module

In addition, a study guide is provided to the learners. It serves as a pre-training resource by orienting learners to the structure, organization, and navigation of the modules and course materials. It provides explicit instructions and guidance on how to effectively navigate through the content, locate specific information, and engage with the instructional resources available. By doing so, the study guide helps learners

develop a mental framework and understanding of how to approach and interact with the course materials.

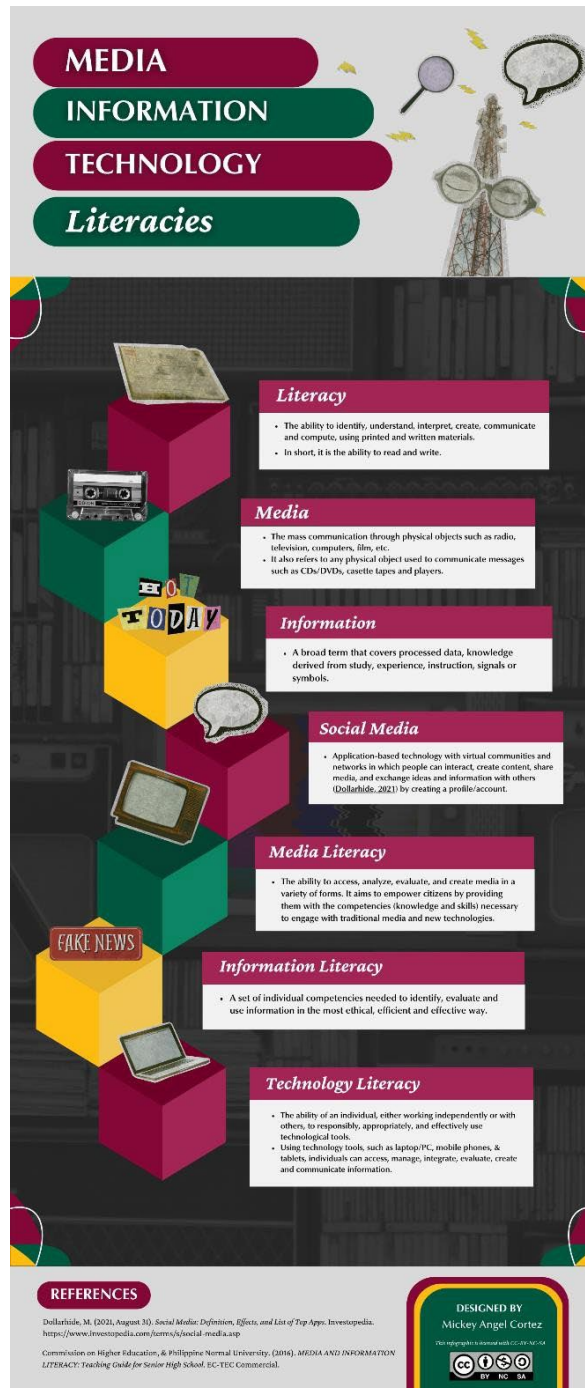


Figure 28: The first infographics in the course integrated into Module 1. It provides definitions of the most crucial terms for understanding Media and Information

Literacy, ensuring that the learners have the necessary foundational knowledge to engage with the course materials effectively.

By applying the pre-training principle, the course materials facilitate a smoother transition into the main instructional content. By activating prior knowledge, establishing a foundation of understanding, and priming learners for new information, the pre-training sections enhance comprehension, retention, and transfer of knowledge.

i. Modality Principle

The modality principle, as part of Mayer's Cognitive Theory of Multimedia Learning (CTML), suggests that learners' understanding and retention of information can be enhanced when relevant visuals are presented in conjunction with spoken narration, rather than presenting visuals with on-screen text (Mayer & Moreno, 2003). In the course materials, particularly the videos, the modality principle is applied by utilizing visuals in combination with narration to optimize learning outcomes. By minimizing on-screen text and incorporating spoken narration in the videos, the course materials leverage the auditory channel to deliver verbal explanations, descriptions, and elaborations of the visual content. This approach allows learners to process the information through both the auditory and visual channels simultaneously, engaging multiple sensory modalities and promoting cognitive processing.

j. Personalization Principle

To adhere to Mayer's principles, the module applies the personalization principle by using conversational language and addressing learners directly (you, we, and our). Moreover, long and complex words are minimally used. This approach

creates a sense of personal connection, making the content more relatable and engaging.

Imagine you're attending a magical masquerade ball with people from various backgrounds and perspectives. However, as the night progresses, you find yourself stuck in a room with only people who share your opinions. Everything seems to go well, right? But soon you will realize that you're trapped in an **"echo chamber."** This metaphor represents the phenomenon where algorithms and personalized content keep feeding us information that aligns with our existing beliefs and preferences.

Figure 29: A description of an “echo chamber” incorporating the personalization principle

The materials incorporate real-world examples and scenarios that resonate with the learners' experiences. By presenting examples and applications that are relevant to their lives, the materials increase the learners' motivation and engagement with the content. This personal relevance helps learners see the practical value of the concepts being taught, making the information more meaningful and memorable.

k. The Voice Principle

The videos in the course have man-made voiceovers (VOs) recorded by the researcher, thereby aligning with the voice principle. VOs are a personal, engaging, and effective mode of instructional delivery. Compared to an AI-generated voice-over that may still come across as robotic and computerized despite the recent innovations in

the Artificial Intelligence (AI) industry, man-made VOs have a more modulated speech rate, tone, intonation, pauses, and other vocal cues which help to guide attention, enhance understanding, and aids in the organization and interpretation of the instructional content,

Moreover, the students can convey enthusiasm or emphasis when necessary, hence becoming a great complement to the visuals. Lastly, the VOs help to make the topics less intimidating and complex, ultimately supporting the learners' cognitive processes and facilitating their learning experience.

I. The Image Principle

In adherence to the image principle, there is only one video in the course that features a talking head video with the instructor, which is only created as per the request of the UPOU MODeL team. The rest of the videos rely on relevant visuals and multimedia elements to enhance learning and minimize extraneous cognitive processing. Graphics, voiceovers, and texts are the primary modalities utilized in instructional videos, eliminating the chances of learners being distracted by the visuals and aesthetics of the lecturer or presenter.

Phase 3: Course Guide and Study Guides

In this phase, a comprehensive course guide and study guides are developed to support learners throughout the MOOC. The [course guide](#) provides an overview of the course objectives, outlines the structure of the modules, and provides guidance on how to navigate the course. A [study guide](#) is also designed to explain the navigation

of the course package and how the OERs can be properly utilized for their endeavors and projects.

Phase 4: Revision of Course Materials for Approval Criteria

Before the MOOC can be launched, a thorough revision of the course materials is conducted to ensure they meet the criteria for approval. This phase involves a critical review of the content, instructional design, and alignment with the learning objectives. A minor revision was done in the materials to fulfill the course approval checklist and to enhance their clarity, coherence, and effectiveness.



Figure 30: Sample revision of the website cover image. The abbreviated term has been fully spelled out since the meaning of MIL may not be universally known or easily inferred by all individuals, particularly those who are less familiar with the subject matter.

Phase 5: Designing the Course Site

After the approval, a course site was created by the MODeL admin. In this phase, all of the course materials and Multimedia OERs are migrated into the course site by the researcher. The course site includes features such as discussion forums, quizzes, and interactive activities that promote engagement and facilitate interaction among learners. The site is segmented weekly to provide an intuitive experience for the MOOC participants. Channels for getting help are also provided so their concerns can be resolved.

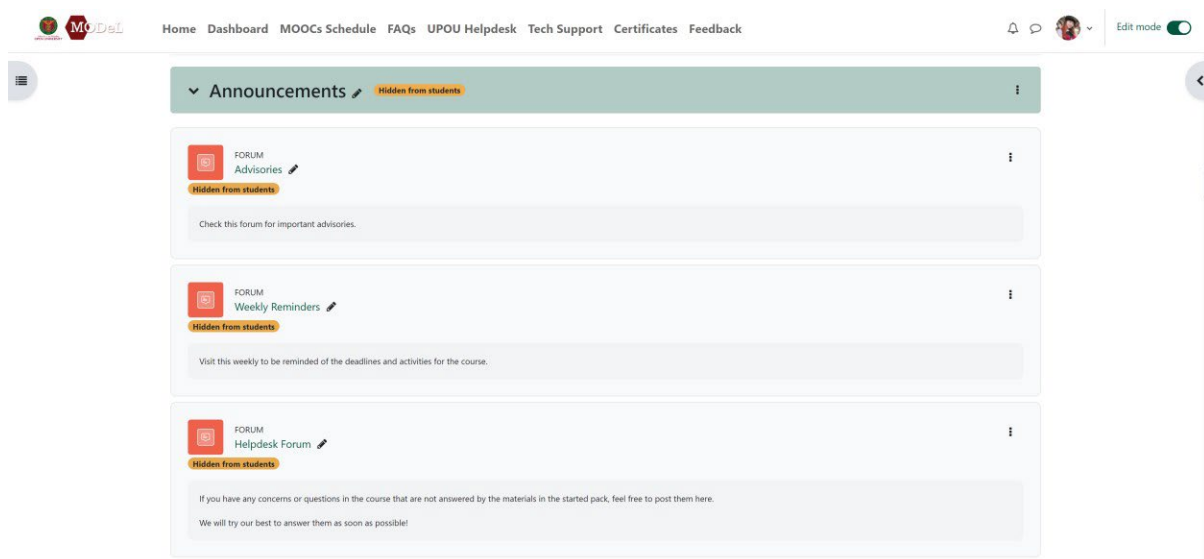


Figure 31: MODeL Course Site in Edit Mode

Phase 6: Promotion

The promotional activities began four weeks before the start date of the MOOC. All of the materials are posted on the official Facebook page of UPOU MODEL. The goal is to raise awareness about the MOOC, enrollment procedures, benefits, and relevance to the target audience.



Figure 32: A promotional material created by UPOU MODeL Team

In addition, the researcher created promotional materials for the project, posted as Instagram (IG) stories on her account (see Figure 33).



Figure 33: Sample Promotional IG Stories

Phase 7: Launching the Short Course

Once all the necessary preparations are complete, the MOOC is officially launched and made available to participants on July 3, 2023. The launch marks the beginning of the learning journey for the participants, who can progress through the course at their own pace and interact with other learners and instructors virtually.

A total of 2983 participants were enrolled in the course. At this stage, the participants have already accessed the modules, engaged with the multimedia OERs, and participated in the activities required to fulfill the course requirements.

Concerns regarding the materials and technical issues on the activities were promptly resolved by the researcher who also served as one of the course coordinators of the MOOC.

Phase 8: Evaluation by the Participants

In the last week of the course, the survey form embedded within the course site has been made available to the participants. This evaluation phase gathered the empirical data and insights required to thoroughly assess the impact of the course materials on participants' learning outcomes, engagement, and satisfaction, together with the possible benefits and challenges.

3.2 Research Design

The empirical nature of the research employs an **embedded mixed methods (MM) approach**, which involves the integration of quantitative and qualitative data collection and analysis within either a traditional quantitative or qualitative research design. This approach allows researchers to combine the benefits of both methodologies. The utilization of a secondary data set can take place before, during, and/or after the primary data collection and analysis procedures typically associated with the larger design (Creswell and Clark, 2017). In the context of the current study, the project draws upon both quantitative and qualitative data. The qualitative data is treated as supplementary and secondary to the quantitative data in addressing the research questions. The integration of quantitative and qualitative data enables a more

comprehensive understanding of the approach or intervention being studied, allowing for triangulation and convergence of findings.

The quantitative component of the research design involves the collection and analysis of numerical data. This includes the administration of surveys or questionnaires to the sample of participants, allowing for the systematic collection of data on various aspects of the research topic. In the current study, the survey aims to gather learners' perspectives on the benefits, challenges, and effects of OERs grounded on Mayer's Theory towards the learning outcomes and learning experience of students. Additionally, quantitative analysis of the course site data, including the completion rate relative to the enrolled number of participants and the scores of students to the objective quizzes, are included in the evaluation.

In addition to quantitative data, the research design also incorporates qualitative methods to gather in-depth insights and perspectives from participants. Qualitative data for the study is collected through open-ended survey questions. Thematic analysis and coding techniques are used to identify patterns and themes from the qualitative data to provide a richer and more nuanced understanding of research findings.

Furthermore, the design-based aspect of the research approach recognizes the importance of incorporating design principles and iterative development cycles in the creation and evaluation of instructional interventions or materials. This approach allows for the continuous improvement and optimization of the intervention or materials to enhance their effectiveness and impact.

In short, the research study is a design-based and empirical study with an embedded mixed-methods design approach, allowing it to fulfill its research objectives and supply the research questions with empirical evidence.

3.3 Respondents of the Study

Out of 2984 participants in the course, a total of 766 respondents voluntarily participated in the study. The respondents are the course enrollees of the Massive Open Online Course (MOOC) titled "Media and Information Literacy in Today's Digital World" from July 3, 2023 up to August 22, 2023. As participants of the MOOC, the respondents represent a diverse population of individuals who have voluntarily chosen to engage in the course to enhance their understanding and proficiency in media and information literacy. They come from various backgrounds, educational levels, and geographic locations, providing a rich and diverse pool of perspectives and experiences.

The inclusion of the course enrollees as respondents allows for the collection of first-hand data regarding their learning experiences, perceptions, and knowledge acquisition throughout the course. By gathering data directly from the target audience, the study can obtain valuable insights into the effectiveness of the MOOC in meeting its learning objectives and fostering media and information literacy competencies.

3.4 Data Gathering Procedure

The data-gathering procedure for this study involved the utilization of a survey form integrated into the course site on Moodle, a widely used learning management

system. The survey form was made visible to the course participants during the final stage of the course, allowing them to voluntarily provide feedback and insights as they exited the course.

By integrating the survey form within the course site, the data-gathering process was seamlessly incorporated into the participants' learning journey. This ensured that the survey was easily accessible to all course participants, minimizing any potential barriers or difficulties in providing feedback. Additionally, the use of an online survey form facilitated the efficient collection of data, eliminating the need for manual data entry or physical distribution and collection of paper-based surveys.

The survey form itself was carefully designed to gather relevant information aligned with the research objectives. It includes a combination of closed-ended and open-ended questions to collect quantitative and qualitative data. The closed-ended questions provided participants with pre-defined response options, enabling the collection of structured and easily quantifiable data. On the other hand, the open-ended questions allowed participants to provide detailed explanations, opinions, and suggestions, capturing nuanced and in-depth insights.

Participation in the survey was voluntary, ensuring that the respondents had the freedom to choose whether or not to participate. Although it is incentivized to encourage the willingness to provide thoughtful feedback, it was made clear that not answering the survey will not prohibit them from receiving a certificate of completion, given that they fulfilled all the course requirements to a passable degree. This approach promoted an environment of informed consent and respect for participant

autonomy. Additionally, Participants were informed about the purpose of the survey, its voluntary nature, and the confidentiality and anonymity of their responses.

3.5 Data Gathering Instruments

There are three data-gathering instruments in the course, namely: the pre-test of learning outcomes, the post-test of learning outcomes and course survey feedback (see Appendix A, B, and C respectively). They are all designed in alignment with the research questions (see Appendix D). All of the surveys and tests are administered via [MODeL in Moodle](#). The “Feedback” component from MODeL is utilized for the input of survey items.

3.6 Data Analysis

The data analysis phase of this study involved the systematic examination and interpretation of the collected data to derive meaningful insights and address the research objectives. The data obtained from the survey responses of the course participants were analyzed using a combination of quantitative and qualitative analysis techniques.

For the quantitative data, descriptive statistics were employed to summarize and present the numerical responses from the closed-ended survey questions. Measures such as frequencies, percentages and means were calculated to provide a clear and concise overview of the participants' perspectives and experiences. These quantitative findings helped identify patterns, trends, and distributions within the data, enabling a comprehensive understanding of the participants' responses.

For the qualitative data, a thematic analysis approach was employed. The open-ended responses from the survey were carefully reviewed, coded, and organized into themes or categories that captured the essence of the participants' qualitative feedback. The identified themes were then analyzed to identify recurring patterns, notable insights, and emerging concepts. This qualitative analysis facilitated a deeper understanding of the participants' perspectives, opinions, and suggestions, providing rich qualitative data that complemented the quantitative findings.

Throughout the data analysis process, rigorous attention was given to ensuring the trustworthiness and reliability of the findings. This involved maintaining clear documentation of the analysis procedures and employing appropriate software tools for data management and analysis.

IV. RESULTS

This section presents and discusses the results from the data gathered by the survey instrument. It is outlined according to the research questions. The study is consistent with the literature conducted within the field.

4.1 Socio-Demographic Profile of Respondents

Sex	
Female	464 (60.57%)
Male	288 (37.60%)
Prefer not to say	14 (1.83%)
Total:	766 (100%)

Table 4: Sex of Participants

The majority of the survey participants are female with a frequency of 288 (37.60%). Meanwhile, 288 participants are male. 14 participants prefer not to state their sexual characteristics.

Age	
20 and below	68 (8.88%)
21-30	439 (57.31%)
31-40	165 (21.54%)
41-50	75 (9.79%)
51 and above	19 (2.48%)
Total:	766 (100%)

Table 5: Age of Participants

The majority of the participants are in the 21-30 age range, with 439 people, or 57.31%. The 20 and below age range has 68 people or 8.88% of the population. The 31-40 age range has 165 people, or 21.54%. The 41-50 age range has 75 people, or 9.79%. And the 51 and above age range has 19 people or 2.48%. In general, the

course enrollees are relatively young, with a median age of 25. The 21-30 age range is the most populous, followed by the 20 and below age range. While the 51 and above age range has the fewest people.

Employment Status	
Employed	468 (61.10%)
Unemployed	72 (9.40%)
Student	162 (21.15%)
Self-employed	64 (8.36%)
Total:	766 (100%)

Table 6: Employment Status of the Course Enrollees

This table illustrates the distribution of individuals' employment statuses within a specific population. The majority are employed (61.10%), followed by students (21.15%), the unemployed (9.40%), and self-employed individuals (8.36%).

Experience taking MOOCs in the Past	
Yes	498 (65.10%)
No	268 (34.99%)
Total:	766 (100%)

Table 7: Previous Experience in Taking MOOCs

According to this table, more than half of the participants, 498 (65.10%), have experience in previously enrolling in MOOCs in the past. Meanwhile, 268 of the course participants who answered the survey were first-timers.

Current Geographical Location	
Philippines	737 (96.21%)
Abroad	29 (3.79%)
Total:	766 (100%)

Table 8: Geographical Location of Participants

727 (96.21%) of the participants are residing in the Philippines, while 29 (3.79%) participants are based overseas.

Highest Educational Attainment	
Some Elementary	1 (1.04%)
Elementary Graduate	3 (0.39%)
Some High School	8 (1.70%)
High School Graduate	45 (5.87%)
Vocational of any Two-year degrees	13 (1.70%)
Some College Units	137 (17.89%)
College Graduate	327 (42.69%)
Some Master's Degree Units	140 (18.28%)
Masters Degree	64 (8.36%)
Some Doctorate Units	15 (1.96%)
Doctorate Degree	13 (1.70%)
Total:	766 (100%)

Table 9: Educational Attainment of the Participants

The table reveals a varied educational spectrum, ranging from individuals with minimal education (1.04% with "Some Elementary") to those with advanced degrees (8.36% holding a "Masters Degree"). Notably, the largest proportion of the population is college graduates (42.69%), followed by those who have completed some master's degree units (18.28%) and some college units (17.89%), indicating a substantial emphasis on higher education. Smaller percentages are distributed across various educational levels, including "High School Graduate" (5.87%), "Elementary Graduate" (0.39%), and "Vocational or Two-year degrees" (1.70%).

Learning Styles	
Visual learning style - you prefer the use of images, graphics, and visuals to access and understand new information.	443 (57.83 %)
Auditory learning style - you understand new content best through listening, speaking, and reading aloud.	72 (9.40 %)
Kinesthetic learning style - you learn best through figuring things out by hand and acting out scenarios.	31 (4.05 %)
Reading/Writing - you learn best rough words. You prefer readings and taking notes while studying.	220 (28.72 %)
Total:	766 (100%)

Table 10: Learning Styles of the Participants

The majority of learners exhibit a "Visual learning style" (57.83%), indicating a preference for images and graphics to comprehend new information. A smaller percentage leans towards an "Auditory learning style" (9.40%), where listening and speaking play a key role. "Kinesthetic learning style" is chosen by a minority (4.05%), characterized by hands-on learning and interactive scenarios. Additionally, a notable percentage resonate with a "Reading/Writing" approach (28.72%), involving words, note-taking, and reading for effective learning.

Means of Discovering the Course	
Social Media (Facebook, Instagram, Twitter, etc.)	471 (61.49 %)
LinkedIn	14 (1.83 %)
Search engine (Google search)	54 (7.05 %)
Friend or Acquaintance	163 (21.28 %)
Website of UPOU	316 (41.25 %)

Blogs or publication	24 (3.13 %)
Other	46 (6.01 %)
Total:	766 (100%)

Table 11: Method of MOOC Discovery

The majority of respondents (61.49%) found out about the Massive Open Online course through popular social media platforms like Facebook, Instagram, and Twitter. This underscores the potent role of social media platforms in promoting MOOCs and raising awareness of relevant educational opportunities. The official website of UPOU played a crucial role, with 41.25% of respondents finding the course through this channel, demonstrating the importance of an institution's digital presence in attracting potential learners. A significant number (21.28%) heard about the course through personal connections, such as friends or acquaintances. Word-of-mouth recommendations remain a potent means of disseminating information. A notable percentage (7.05%) utilized search engines, particularly Google, to actively seek out the course. A variety of other sources (6.01%) contributed to course promotion, while a smaller portion (3.13%) came across the MIL MOOC via other blogs or publications and the remaining 1.83% was informed about the course through the professional networking site, LinkedIn. All in all, several channels were utilized in the active promotion of the course, hence garnering over 3000 voluntary enrollees.

4.2 Motivations for Enrolling in the Course

When asked about their primary driver/motivation in enrolling on the course, the responses of the enrollees can be classified into:

1. Professional Development and Career Advancement: Many enrollees are driven by the prospect of acquiring a certification that holds the status of a micro-credential, a valuable addition to their curriculum vitae (CV). This credential not only enhances their employability but also serves as a testament to their commitment to continuous learning. The knowledge and skills obtained through the course are not only applicable to future career opportunities but are also immediately transferrable to their current roles, allowing them to excel and contribute effectively in their professional domains.

Sample Quotes: (1) "I want to enhance my knowledge in media and literacy that will be helpful for me in my teaching career." **(2)** "To earn many certificates for my CV preparation." **(3)** "I took on enrolling in this course because I believe it might help me with my future endeavor in wanting to become a Licensed Sports Manager." **(4)** "my chosen career which is to become a journalist someday."

2. Curiosity/Interest in the Subject Matter: A notable group of enrollees are drawn to the course by an intrinsic curiosity and a genuine interest in the subject matter, particularly Media and Information Literacy. The novelty and relevance of

this topic capture their attention, prompting them to explore and engage with it further. They recognize the significance of understanding how media and information are disseminated, consumed, and interpreted in today's digital age. Their eagerness to delve into this uncharted territory stems from a genuine thirst for knowledge and a desire to navigate the complexities of modern media landscapes.

Sample Quotes: (1) "I was motivated to enroll in this course because I am interested in the topic." (2) "I am interested in the ways that media can influence people and I believe that this course will give me a better understanding of how to critically consume media." (3) "I got curious of digital literacy topics especially since we are now in the digital age where misinformation is rampant."

3. Personal Growth: Beyond career prospects, another motivating factor for enrolling in the course is personal growth. These enrollees view education as a means of self-improvement and self-discovery. They recognize that learning about Media and Information Literacy has the potential to broaden their intellectual horizons, enhance critical thinking skills, and foster a deeper understanding of the world around them. For them, the course represents an opportunity for holistic development, enabling them to become more informed and engaged citizens who can critically assess the information they encounter.

Sample Quotes: (1) "I'm motivated to enroll in the Media and Information Literacy Course because I believe that it's essential to be informed and aware of the information we consume from the media. I want to learn how to identify reliable sources of information, become more critical in the way I interpret media information, and understand how my choices in media consumption can influence my beliefs and opinions." (2) "To begin with, since it is our summer vacation, I want to utilize my time in ways that will nurture my growth and development." (3) "Just myself and my personal motivation to broaden my knowledge and gain a deeper understanding of this topic are the reasons why I enrolled in this course."

RQ1: TO WHAT EXTENT DO OPEN EDUCATIONAL RESOURCES (OERS) GROUNDED ON MAYER'S COGNITIVE THEORY OF MULTIMEDIA LEARNING (CTML) ENHANCE STUDENTS' LEARNING OUTCOMES IN A MASSIVE OPEN ONLINE COURSE (MOOC)?

To assess the effectiveness of the intervention based on the Cognitive Theory of Multimedia Learning (CTML), a structured evaluation process is employed. This involves the implementation of both a pre-test and a post-test to measure and compare the learning outcomes. A comprehensive set of 20 distinct learning outcomes (4 outcomes per each of the 5 modules) is meticulously examined on an individual basis.

The pre-test serves as a baseline assessment, capturing the initial level of understanding and knowledge before the intervention. This was held during the first week of class. Following the intervention, the post-test in the last week of class is

administered to gauge the extent to which the participants' learning outcomes have been positively influenced.

By scrutinizing each of the 20 learning outcomes separately, this approach provides a granular and detailed analysis. It allows for a comprehensive understanding of the impact of the CTML-based materials on participants' learning progress. Through this comparative analysis, the effectiveness of the intervention is quantitatively measured, shedding light on the degree of improvement achieved and offering insights into the strengths and areas for enhancement in the instructional approach.

Learning Outcome 1: Define Media and Information Literacy and its related concepts in my own words					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	268 (14.46%)	439 (23.69%)	775 (41.82%)	314 (16.95%)	57 (3.08%)
Post-test (n = 682)	348 (51.03%)	299 (43.84%)	31 (4.55%)	4 (0.59%)	0
Learning Outcome 2: Explain the relationship of information to data, knowledge, and wisdom					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	240 (12.95%)	463 (24.99%)	751 (40.53%)	329 (17.75%)	70 (3.78%)
Post-test (n = 682)	358 (12.95%)	287 (42.08%)	37 (5.43%)	0	0
Learning Outcome 3: Describe the contemporary Philippine media landscape and the current issues it faces					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	179 (9.66%)	345 (18.62%)	690 (37.24%)	466 (25.15%)	173 (9.34%)
Post-test (n = 682)	256 (37.54%)	328 (48.09%)	90 (13.20%)	8 (1.17%)	0

Learning Outcome 4: Examine how media literacy, information literacy, and technology literacy both differ and relate to one another					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	202 (10.90%)	414 (22.34%)	688 (37.13%)	414 (22.34%)	135 (7.29%)
Post-test (n = 682)	340 (49.85%)	290 (42.52%)	50 (7.33%)	2 (0.29%)	0
Learning Outcome 5: Differentiate between an influencer and a journalist					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	575 (31.03%)	644 (34.75%)	459 (24.77%)	155 (8.36%)	20 (1.08%)
Post-test (n = 682)	497 (72.87%)	161 (23.61%)	22 (3.23%)	1 (0.15%)	1 (0.15%)
Learning Outcome 6: Identify the different types of information disorder					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	144 (7.77%)	266 (14.36%)	632 (34.11%)	430 (23.21%)	381 (20.56%)
Post-test (n = 682)	337 (49.41%)	289 (42.38%)	55 (8.06 %)	0	1 (0.15%)
Learning Outcome 7: Enumerate the types of disinformation					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	183 (9.88%)	291 (15.70%)	636 (34.32%)	454 (24.50%)	289 (15.60%)
Post-test (n = 682)	333 (48.83%)	290 (42.52%)	56 (8.21%)	3 (0.44%)	0

Learning Outcome 8: Discuss how to call out family members who share false information on social media					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	304 (16.41%)	461 (24.88%)	592 (31.95%)	393 (21.21%)	103 (5.56%)
Post-test (n = 682)	368 (53.52%)	266 (39.00%)	49 (7.18%)	2 (0.29%)	0
Learning Outcome 9: Identify the selection criteria for assessing information					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	227 (12.25%)	407 (21.96%)	627 (33.84%)	393 (21.21%)	169 (10.74 %)
Post-test (n = 682)	368 (53.52%)	266 (39.00%)	49 (7.18%)	2 (0.29%)	0
Learning Outcome 10: Analyze each information source by asking the right questions					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	296 (15.97%)	500 (26.98%)	644 (34.75%)	317 (17.11%)	80 (4.32%)
Post-test (n = 682)	361 (52.93%)	280 (41.06%)	33 (4.84%)	2 (0.29%)	0
Learning Outcome 11: Filter information in terms of reliability, credibility, and accuracy					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	371 (20.02%)	578 (31.19%)	581 (31.35%)	256 (13.82%)	53 (2.86%)
Post-test (n = 682)	394 (57.77%)	261 (38.27%)	22 (3.23%)	0	0

Learning Outcome 12: Decide for me which information sources are the most suitable for my needs					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	494 (26.66%)	660 (35.62%)	494 (26.66%)	177 (9.55%)	28 (1.51%)
Post-test (n = 682)	432 (63.34%)	230 (33.72%)	18 (2.64%)	2 (0.29%)	0
Learning Outcome 13: Define responsible digital citizenship					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	386 (20.83%)	560 (30.22%)	567 (30.60%)	249 (13.44%)	91 (4.91%)
Post-test (n = 682)	407 (59.68%)	245 (35.92%)	25 (3.67%)	5 (0.73%)	0
Learning Outcome 14: Determine ways to fact-check					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	423 (22.83%)	562 (30.33%)	601 (32.43%)	230 (12.41%)	37 (2.00%)
Post-test (n = 682)	429 (62.90%)	237 (34.75%)	15 (2.20%)	1 (0.15%)	0
Learning Outcome 15: Know how I can protect myself from scams and data privacy issues online					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	433 (23.37%)	593 (32.00%)	572 (30.87%)	227 (12.25%)	28 (1.51%)
Post-test (n = 682)	438 (64.22%)	222 (32.55%)	20 (2.93%)	2 (0.29%)	0

Learning Outcome 16: Enumerate various factors that affect the media and information I consume					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	261 (14.09%)	491 (26.50%)	667 (36.00%)	327 (17.65%)	107 (5.77%)
Post-test (n = 682)	348 (51.03%)	291 (42.67%)	41 (6.01%)	2 (0.29%)	0
Learning Outcome 17: Identify the proper process behind the creation and sharing of information					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	250 (13.49%)	438 (23.64%)	656 (35.40%)	364 (19.64%)	145 (7.83%)
Post-test (n = 682)	333 (48.83%)	301 (44.13%)	46 (6.74%)	2 (0.29%)	0
Learning Outcome 18: Enumerate Philippine Laws the regulate free speech					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	164 (8.85%)	172 (9.28%)	544 (29.36%)	578 (31.19%)	395 (21.32%)
Post-test (n = 682)	230 (33.72%)	309 (45.31%)	120 (17.60%)	23 (3.37%)	0
Learning Outcome 19: Determine visual design principles and elements					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	219 (11.82%)	366 (19.75%)	597 (32.22%)	417 (22.50%)	254 (13.71%)
Post-test (n = 682)	307 (45.01%)	274 (40.18%)	94 (13.78%)	6 (0.88%)	1 (0.15%)

Learning Outcome 20: Design a media product that is well-researched, properly gives attribution and credits to others, and adheres to aesthetic design principles					
	A Great Deal	A Lot	Somewhat	Just A Little	Not At All
Pre-test (n = 1853)	229 (12.36%)	314 (16.95%)	638 (34.43%)	431 (23.26%)	241 (13.01%)
Post-test (n = 682)	302 (44.28%)	294 (43.11%)	79 (11.58%)	7 (1.03%)	0

Table 12: Summary of Pre-test and Post-test Results of the Learning Outcomes

Overall Observation:

- **A Great Deal:** There was a substantial increase in participants who reported an "A Great Deal" of learning from the pre-test and the post-test.
- **A Lot:** The percentage of participants who reported "A Lot" of learning also increased, from the pre-test and the post-test.
- **Somewhat:** The percentage of participants who reported "somewhat" decreased significantly, from the pre-test to post-test
- **Just a Little:** The number of participants who reported "Just a Little" decreased dramatically, from a three-figure count to a two- and single-digit count.
- **Not at All:** The percentage of participants who reported "Not at All" decreased up to 0% in the post-test, transitioning from a three-figure count to a single-digit count.

RQ2: TO WHAT EXTENT DO THE PRINCIPLES OF MAYER'S CTML THEORY OF MULTIMEDIA LEARNING HELP TO LESSEN COGNITIVE LOAD IT TAKES TO LEARN THE CONCEPTS IN THE MOOC?

To answer this research question, the cognitive load of the participants were measured with a self-report scale from modified survey questions from instrument measuring intrinsic, extraneous, germane, and cognitive Load (Klepsch et al., 2017). Their sentiments with each of the multimedia learning principle was also gauged.

Note: All items are rated on a 7-point Likert-scale from Absolutely Wrong - 7 6 5 4 3 2 1 - Absolutely Right

Intrinsic Cognitive Load (ICL)								
	7	6	5	4	3	2	1	Average Score
Several things need to be kept in mind all at once when it comes to learning with the Multimedia OERs (n=766)	39 (5.09%)	39 (5.09%)	63 (8.22%)	110 (14.36%)	129 (16.84%)	135 (17.62%)	251 (32.77%)	2.83
The Multimedia OERs are very complex. (n=766)	101 (13.19%)	98 (12.79%)	114 (14.88%)	136 (17.75%)	131 (17.10%)	98 (12.79%)	88 (11.49%)	4.03
Germane Cognitive Load (GCL)								
With the Multimedia OERs, I made a huge mental effort to understand the details and to understand the overall context of the topics and lessons (n=766)	63 (8.22%)	78 (10.18%)	88 (11.49%)	106 (13.84%)	131 (17.10%)	131 (17.10%)	169 (22.06%)	3.39
My primary goal while learning with the Multimedia OERs is to understand everything accurately.	101 (13.19%)	98 (12.79%)	114 (14.88%)	136 (17.75%)	131 (17.10%)	98 (12.79%)	88 (11.49%)	2.14
The Multimedia OERs consisted of elements that supported my comprehension of the topics and activities.	13 (1.70%)	20 (2.61%)	18 (2.35%)	43 (5.61%)	100 (13.05%)	198 (25.85%)	374 (48.83%)	2.01

Extraneous Cognitive Load (ECL)									
I find it exhausting to find the important information in the Multimedia OERs. (n=766)	236 (30.81%)	173 (22.58%)	122 (15.93%)	85 (11.10%)	63 (8.22%)	48 (6.27%)	39 (5.09%)	5.17	
The design of the Multimedia OERs is very inconvenient for learning.	286 (37.34%)	150 (19.58%)	87 (11.36%)	42 (5.48%)	36 (4.70%)	53 (6.92%)	112 (14.62%)	5.00	
It was difficult to recognize and link the crucial information in the Multimedia OERs.	280 (36.55%)	190 (24.80%)	112 (14.62%)	59 (7.70%)	47 (6.14%)	41 (5.35%)	37 (4.83%)	5.43	

Table 13: Self-reported Measurement of the Participants' Cognitive Load Levels

Intrinsic Cognitive Load (ICL)

Data from this cognitive umbrella reveals a significant portion of participants perceive a higher level of cognitive load and complexity associated with learning using Multimedia OERs. The majority of respondents leaned toward agreeing that they need to keep several things in mind all at once (2.89) when using Multimedia OERs. On the other hand, the perception of complexity is considerably neutral (4.03).

Germane Cognitive Load (GCL)

From the data, it can be inferred that a significant number of participants perceive that they invested substantial mental effort to understand both the details and overall context of topics and lessons when using Multimedia OERs. A notable portion of respondents indicated that their primary goal in using Multimedia OERs was to achieve accurate understanding. A substantial majority acknowledged the presence of supportive elements within the Multimedia OERs that contributed to their comprehension of the subject matter.

Extraneous Cognitive Load (ECL)

Given that the items in question are subject to negative coding, the optimal average score would naturally exceed 4 (neutral). An evident pattern becomes discernible when analyzing the mean scores across the triad of items within this cognitive load type. Notably, each of these items: *I find it exhausting to find the important information in the Multimedia OERs*; *the design of the Multimedia OERs is very inconvenient for learning*; *it was difficult to recognize and link the crucial information in the Multimedia OERs*, achieved scores surpassing the threshold of 5.00, specifically, 5.17, 5.00, and 5.43.

4.3 Measurement of Multimedia Principles' Applicability in the MOOC

Within this segment of the survey, specific items have been extracted and adjusted from the original scale introduced by Ayub et al. (2018). These modifications were made to align the items more effectively with the prevailing parameters and scope of the present study.

COHERENCE PRINCIPLE: I prefer simple text and visuals to the multimedia OERs as opposed to complex graphics and more intricate animations				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
250 (13.49%)	438 (23.64%)	656 (35.40%)	364 (19.64%)	145 (7.83%)
Total: 37.13%			Total: 27.47%	

Table 14: Results of the Coherence Principle

Based on the total percentages of the respondents, most respondents (13.49% + 23.64%) disagree on the coherence principle. Meaning to say, they prefer complex graphics and more detailed animations. This is an inconsistent finding to the studies stating that simple graphics and animations are preferred by the learners. A significant 35.40% of the learners, on the other hand, have a neutral stance, while a total of 24.47% of the learners from the agree and strongly agree portions are in agreement with the principle.

MULTIMEDIA PRINCIPLE: The inclusion of visuals (graphics, animation, or image) and words in the Multimedia OERs helped me learn faster and understand the content more effectively compared to a traditional text-based module.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

20 (2.61%)	3 (0.39%)	74 (9.66%)	219 (28.59%)	450 (58.75%)
Total: 3%			Total: 87.34%	

Table 15: Results of the Multimedia Principle

Combining the responses from the "Agree" and "Strongly Agree" categories, a total of 669 participants (87.34%) indicated agreement with the Multimedia Principle. This highlights that the majority recognized the positive impact of visual-textual integration on learning speed and content understanding.

SIGNALING PRINCIPLE: The highlights and formatting in the text and the signaling markers (arrows and circles) helped to direct my attention to the most important content of the lessons.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
19 (2.48%)	5 (0.65%)	78 (10.18%)	265 (34.60%)	399 (52.09%)
Total: 3.13%			Total: 86.69%	

Table 16: Results of the Signaling Principle

A majority of respondents (86.69%) agreed or strongly agreed with the signaling principle, indicating that they found the use of highlights, formatting, and signaling markers effective in directing their attention to the most important content of the lessons. Only a small percentage of respondents disagreed or strongly disagreed with the statement (3.13%).

MODALITY PRINCIPLE: I would prefer the combination of animation and audio narration as opposed to animation and on-screen text in the videos presented in this course.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
28 (3.66%)	55 (7.18%)	258 (33.68%)	236 (30.81%)	189 (24.67%)
Total: 10.84%			Total: 55.48%	

Table 17: Results of the Modality Principle

Although relatively lower than the above percentages, a considerable portion of respondents (55.48%) either agreed or strongly agreed that they would prefer the combination of animation and audio narration over animation and on-screen text in the course videos. This suggests that more than half of the respondents found animation paired with audio narration preferable compared to animation with on-screen text. On the other hand, a smaller percentage of respondents (10.84%) disagreed or strongly disagreed with this preference.

However, when it comes to discrete weighing of categories, the number of respondents who answered “Neutral” is the highest at 258 respondents, composed of 33.68%. In this regard, this principle is considered partially supported by this study.

SPATIAL CONTIGUITY PRINCIPLE: The text and visuals are adequately spaced towards one another (not too far and not too near), helping me to comprehend the lessons about MIL better				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
18 (2.35%)	6 (0.78%)	96 (12.53%)	329 (42.95%)	317 (41.38%)
Total: 3.13%			Total: 84.33%	

Table 18: Results of the Spatial Contiguity Principle

A majority of respondents (84.33%) either agreed or strongly agreed that the spacing between the text and visuals in the lessons was adequate and helped them comprehend the lessons about MIL better. A smaller percentage of respondents (3.13%) disagreed or strongly disagreed with this statement.

REDUNDANCY PRINCIPLE: I think that the combination of audio voiceover and graphics in videos is adequate, a word-by-word text is not necessary to the narration.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
48 (6.27%)	122 (15.93%)	222 (28.98%)	226 (29.50%)	148 (19.32%)
Total: 22.2%			Total: 48.82%	

Table 19: Results of the Redundancy Principle

The total percentage of respondents who either "Agree" or "Strongly Agree" (48.82%) suggests that a substantial portion of the participants find the combination of audio voiceover and graphics in videos to be adequate without the need for word-by-word text in the narration. The "Neutral" category received a considerably high percentage relative to this dataset (28.98%), implying a degree of uncertainty or a lack of strong opinions regarding the necessity of word-by-word text alongside audio and graphics.

SEGMENTING PRINCIPLE: The timestamps in the videos and the interactive timeline in the Google Course Site allowed me to learn the concepts in segments, thus making the topics more digestible.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
13 (1.70%)	7 (0.91%)	137 (17.89%)	348 (45.43%)	261 (34.07%)
Total: 2.61%			Total: 79.5%	

Table 20: Results of the Segmenting Principle

The cumulative percentage of respondents who either "Agree" or "Strongly Agree" (79.5%) indicates that a substantial majority of participants found that the use of timestamps in videos and an interactive timeline in the Google Course Site facilitated their learning experience by allowing them to approach concepts in manageable segments. This led to an improved comprehension of the topics.

The percentage of respondents who either "Strongly Disagree" or "Disagree" (2.61%) is relatively low, implying that a small portion of respondents did not believe that the provided features effectively contributed to learning in segments or to the digestibility of topics.

TEMPORAL CONTIGUITY PRINCIPLE: I think the timing of the audio voiceover, motion graphics, and text are synchronized in the videos, which facilitated my learning process of the topic it covers.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13 (1.70%)	6 (0.78%)	149 (19.45%)	344 (44.91%)	254 (33.16%)
Total: 2.48%			Total: 78.07%	

Table 21: Results of the Temporal Contiguity

The cumulative percentage of respondents who either "Agree" or "Strongly Agree" (78.07%) indicates that a significant majority of participants perceived that the synchronization of audio voiceover, motion graphics, and text timing in the videos positively facilitated their learning process related to the covered topic. The "Neutral" category received a considerably low percentage of responses (19.45%), suggesting that a significant proportion of participants neither strongly agreed nor disagreed with the statement. These individuals likely held mixed opinions or were uncertain about the extent to which timing synchronization influenced their learning experience. Meanwhile, the percentage of respondents who either "Strongly Disagree" or "Disagree" (2.48%) is relatively low.

PERSONALIZATION PRINCIPLE: I think a formal academic language with complex vocabulary instead of a casual and conversational style of writing in modules and speaking in videos are more effective in facilitating my learning process				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
71 (9.27%)	146 (19.06%)	233 (30.42%)	203 (26.50%)	113 (14.75%)
Total: 28.31%			Total: 41.25%	

Table 22: Results of the Personalization Principle

The cumulative percentage of respondents who either "Agree" or "Strongly Agree" (41.25%) indicates that a minority of participants found that a formal academic language with complex vocabulary is more effective in facilitating their learning process, in contrast to a casual and conversational style. This group believed that a more sophisticated language style enhanced their learning experience. The "Neutral" category received a substantial percentage of responses (30.42%), implying that a significant number of participants neither strongly agreed nor disagreed with the statement. These individuals likely held mixed opinions about the effectiveness of language style on their learning process. The percentage of respondents who either "Strongly Disagree" or "Disagree" (28.31%) is relatively on the lower end of the spectrum, suggesting that a notable portion of respondents did not believe that using formal academic language with complex vocabulary was more effective in facilitating

their learning process. They may have preferred a more casual and conversational approach.

VOICE PRINCIPLE: An authentic human voice in the voiceover in videos helped me to learn and understand the topics better than an AI-generated voice would.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11 (1.44%)	19 (2.48%)	180 (23.50%)	297 (38.77%)	259 (33.81%)
Total: 3.92%			Total: 72.58%	

Table 23: Results of the Voice Principle

The cumulative percentage of respondents who either "Agree" or "Strongly Agree" (72.58%) suggests that a significant majority of participants found that an authentic human voice in video voiceovers contributed to a better learning experience and understanding of the topics, compared to an AI-generated voice. This implies that a human voice adds authenticity and improves comprehension. The "Neutral" category received a substantial percentage of responses (23.50%), while the percentage of respondents who either "Strongly Disagree" or "Disagree" (3.92%) is relatively low. This indicates that only a small portion of respondents did not agree with the principle.

IMAGE PRINCIPLE: When it comes to instructional videos, I think I would have learned better from talking head videos that show the actual face and body of the presenter rather than the combination of graphics, animation, voiceover and text alone.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
84 (10.97%)	174 (22.72%)	280 (36.55%)	149 (19.45%)	79 (10.31%)
Total: 33.69%			Total: 29.76%	

Table 24: Results of the Image Principle

When it comes to individual categories, respondents with a neutral stance on the image principle scored the highest percentage at 36.55% with 280 respondents. Meanwhile, the combined responses of those who either disagree or strongly disagree (33.69%) are higher than those who either agree or strongly agree (29.76%).

PRE-TRAINING PRINCIPLE: I think the course properly and adequately introduced the topics, allowing me to grasp the basic foundational definitions, terms, and concepts that were crucial for me to understand the bigger picture of MIL.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14 (1.83%)	2 (0.26%)	92 (12.01%)	281 (36.68%)	377 (49.22%)
Total: 2.09%			Total: 85.9%	

Table 25: Results of the Pre-training Principle

The cumulative percentage of respondents who either "Agree" or "Strongly Agree" (85.9%) signifies that a significant majority of participants found that the course's introductory content was effective in properly acquainting them with foundational definitions, terms, and concepts. This foundational understanding was deemed crucial for their subsequent grasp of the broader picture of Media and Information Literacy. The "Neutral" category received a small percentage of responses (12.01%), suggesting that a considerable number of participants adopted a middle-ground stance regarding the efficacy of the pre-training content. The percentage of respondents who either "Strongly Disagree" or "Disagree" (2.09%) is relatively the lowest, indicating that only a small portion of respondents did not believe that the introductory content was sufficient for establishing the necessary foundational knowledge.

RQ3: WHAT ARE THE PERCEIVED BENEFITS AND CHALLENGES OF IMPLEMENTING OERS GROUNDED ON MAYER'S COGNITIVE THEORY IN A MOOC FROM THE PERSPECTIVE OF STUDENTS?

In this part, pre-defined questions are designed to ascertain the benefits and challenges of how the researcher has incorporated the CTML into the OERs. In the latter part of the survey, open-ended questions revealed additional qualitative insights into the learning experience of the learners/survey participants.

4.4 Benefits

Did the use of multimedia-based OERs enhance your motivation to actively participate in the course and finish the requirements?				
Not at all	Somewhat	Moderately	Mostly	Very Much

2 (0.26%)	14 (1.83%)	84 (10.97%)	258 (33.68%)	408 (53.26%)
Total: 2.09%			Total: 86.94%	

Table 26: Motivation as a Benefit

Combining the responses from the "Mostly" and "Very Much" categories, a total of 666 participants (86.94%) reported experiencing significant motivation enhancement due to the use of multimedia-based OERs. This high percentage suggests that the majority of respondents found these resources valuable in boosting their motivation. Only a small proportion of participants, 16 (2.09%), indicated that the use of multimedia-based OERs had a minimal impact on their motivation ("Not at all" and "Somewhat" categories combined). This suggests that the resources had a relatively limited effect on a minority of respondents.

Did the OERs effectively integrate multimedia elements (such as text, images, and videos) to present information in a visually appealing and engaging manner that stimulated your interest?				
Not at all	Somewhat	Moderately	Mostly	Very Much
3 (0.39%)	7 (0.91%)	58 (7.57%)	261 (34.07%)	437 (57.05%)
Total: 1.3%			Total: 91.12%	

Table 27: Visually Appeal as a Benefit

Combining the responses from "Mostly" and "Very Much" categories, a total of 698 participants (91.12%) reported that the OERs effectively integrated multimedia elements and stimulated their interest to a significant extent. This indicates that the majority of participants found the multimedia integration successful in engaging them. Only a small proportion of participants, 10 (1.3%), indicated that the OERs had a limited impact on integrating multimedia elements and stimulating their interest ("Not at all" and "Somewhat" categories combined). This suggests that a minority of participants found the multimedia integration to be less effective.

Did the OERs offer opportunities for interactive learning activities (e.g., quizzes, simulations, discussions) that fostered your engagement and deepened your understanding?				
Not at all	Somewhat	Moderately	Mostly	Very Much
2 (0.26%)	8 (1.04%)	82 (10.70%)	258 (33.68%)	416 (54.31%)
Total: 1.3%			Total: 87.99%	

Table 28: Opportunities for Interactive Learning Activities as a Benefit

In the merged responses from "Mostly" and "Very Much" categories, a total of 674 participants (87.99%) reported that the OERs effectively offered opportunities for interactive learning activities that fostered their engagement and deepened their understanding. This indicates that the majority of participants found the interactive activities successful in enhancing their learning experience.

Only a small proportion of participants, 10 (1.3%), indicated that the OERs had a limited impact on offering interactive learning activities that fostered engagement and understanding ("Not at all" and "Somewhat" categories combined). This suggests that a minority of participants found the interactive activities to be less effective.

Did the OERs provide access to additional resources or references that complemented the course content and enriched your learning experience?				
Not at all	Somewhat	Moderately	Mostly	Very Much
1 (0.13%)	10 (1.31%)	62 (8.09%)	248 (32.51%)	444 (57.96%)
Total: 1.44%			Total: 90.47%	

Table 29: Access to Additional Resources or References as a Benefit

Combining the responses from the "Mostly" and "Very Much" categories, a total of 692 participants (90.47%) reported that the OERs effectively provided access to additional resources or references that complemented the course content and enriched their learning experience. This indicates that the majority of participants found the supplemental resources valuable for enhancing their learning. Only a small proportion of participants, 11 (1.44%), indicated that the OERs had a limited impact

on providing additional resources that complemented the course content and enriched their learning experience ("Not at all" and "Somewhat" categories combined). This suggests that a minority of participants found the supplemental resources to be less effective.

Analyzing the data suggests that the Open Educational Resources (OERs) largely succeeded in providing access to additional resources or references that complemented the course content and enriched participants' learning experiences.

4.5 Challenges

How often did you encounter any technical difficulties or issues while accessing or navigating the OERs?				
Never	Rarely	Sometimes	Always	Often
233 (30.42%)	336 (43.86%)	149 (19.45%)	35 (4.57%)	13 (1.70%)
Total: 74.28%			Total: 6.27%	

Table 30: Frequency that the participants have encountered difficulty/issue while accessing or navigating the OERs

The majority of respondents, 569 participants (74.28%), reported either "Never" or "Rarely" encountering technical difficulties. This suggests that a significant portion of participants had a relatively smooth experience without major technical challenges.

V. DISCUSSIONS

5.1 On the Socio-demographic Profile of Respondents

The socio-demographic profile of course enrollees encompasses a diverse range of generational backgrounds, implying varying technological skills and affecting familiarity with course site navigation, expectations, and perceived course difficulty. Additionally, the occupational diversity and current activities of participants influence their time management and focus, impacting their ability to meet course deadlines. Geographical disparities in timezones and internet connectivity further complicate the learning experience. Lastly, disparities in educational attainment result in differing levels of prior knowledge, reading comprehension, and subject mastery, necessitating tailored support and resources. Collectively, these factors highlight the multifaceted ways in which course enrollees engage with and process new content from learning materials, underscoring the need for flexible, inclusive, and responsive approaches to designing instructional materials. Recognizing and understanding these differences is essential for creating inclusive and effective online learning environments. By tailoring instructional strategies, support systems, and course design to accommodate this diversity, educators can ensure that every learner has the opportunity to thrive in the world of distance education.

5.2 Achievement of Learning Outcomes in the Course

Based on the findings, a clear overarching trend emerges: participants' responses underwent a notable transformation, transitioning from a negative to neutral level of learning ("Somewhat," "Just a Little," and "Not at All") to decidedly more positive sentiments ("A Great Deal" and "A Lot"). Thus, after engaging with the course materials and activities, the participants effectively improved in all of the 20 learning

outcomes in the course. In other words, the consistently positive results highlight the effectiveness of the CTML-grounded Multimedia learning materials as a learning intervention for the acquisition of learning outcomes in the Massive Open Online Course.

5.3 Intrinsic Cognitive Load (ICL)

When it comes to cognitive load management, there are items in which a high cognitive load is detected from participants, specifically in terms of Intrinsic Cognitive Load (ICL). A possible interpretation behind this is the way the survey item is worded. The cognitive load scale adapted from Klepsch et al. (2017) was originally written in German. The English translation is stated in their study as well. When it comes to designing survey scales and items, semantics and syntaxes are crucial. Even a single-word alteration can change the leanings of the survey participants and hence the result. The sentence, “Several things need to be kept in mind all at once when it comes to learning with the Multimedia OERs,” can be interpreted as a reflection of the intricate mental processes required when engaging with Multimedia learning materials. Participants may have contemplated the multifaceted nature of simultaneously processing various elements inherent in multimedia learning materials. This perception of cognitive demand could have influenced respondents to indicate a higher cognitive load, potentially shaped by the phrasing and linguistic nuances of the translated survey item. As such, the specific wording of the item might have heightened participants' awareness of cognitive challenges, yielding the distribution of responses observed in the data.

Additionally, since the survey is conducted asynchronously, the researcher is not able to elaborate or rephrase the context of the survey items to them learners in case there was confusion. Therefore, creating and validating a self-reported intrinsic cognitive load survey originally written in the English language is a must to ensure accurate interpretation by the survey participants.

Moreover, the subject of Media and Information Literacy encompasses intricate topics that could pose challenges for novice learners lacking prior exposure to the topic, thereby requiring a greater cognitive load compared to individuals already acquainted with the concept.

5.4 Germane Cognitive Load (GCL)

The high scores in mental effort for the first and two survey items under this cognitive load do not necessarily mean the materials failed to do their job in lessening the cognitive load of learners. To reiterate, their interpretation of the survey item might have varied from the intended meaning. Investing mental effort might be perceived as a positive answer for them because they might have thought that it signifies their effort in learning the course. A similar rationale applies to the subsequent item: My primary goal while learning with the Multimedia OERs is to understand everything accurately. Since one of the pedagogical principles of Media and Information Literacy is learning how to assess the accuracy of information, most of the participants went with a score that leaned heavily towards "absolutely right."

Furthermore, this phenomenon possibly qualifies under "social desirability bias." Social desirability bias occurs when respondents in a research study provide answers that they believe are socially acceptable or favorable rather than giving their

true, honest opinions or behaviors to make their image look better (Nikolopoulou, 2022). This bias can lead to skewed or inaccurate results, as respondents may alter their responses to align with perceived societal norms or researcher expectations. This is a common challenge in survey and interview-based research, where participants might be hesitant to admit certain behaviors or opinions that could be viewed negatively.

Lastly, it is notable that the item: Multimedia OERs consisted of elements that supported my comprehension of the topics and activities, and scored the highest towards absolutely right out of all other items in this survey. This noteworthy result suggests that learners widely perceive the Multimedia OERs in the study to be adeptly designed with components that enhance their understanding of the subject matter and learning tasks. The prominence of this positive sentiment underscores the effectiveness of integrating supportive elements within Multimedia OERs, such as suggested readings and micro-interactions, potentially contributing to an enriched and more fruitful learning experience for the participants.

5.5 Extraneous Cognitive Load (ECL)

A substantial majority of learners agree that crucial information is easy to locate, recognize and link in the designed Multimedia OERs. Moreover, most of them agree that these are convenient for learning. All things considered, the Multimedia OERs designed for the course have effectively reduced ECL. This success underscores the value of well-designed multimedia materials in enhancing the overall learning experience and reaffirms their role in promoting accessible and efficient education.

5.6 Multimedia Principles

5.6.1 Coherence Principle

The distribution of responses under this item underscores the complexity and diversity of learner preferences when it comes to the design and presentation of educational materials. Majority of the learners prefer complex graphics and animation while there's a minority that prefer simple and clear visuals. This variability highlights the importance of considering individual differences and catering to a wide range of preferences to effectively engage and support learners. This could involve providing options for both simple and complex visuals, as well as incorporating a mix of multimedia elements to accommodate the varying preferences within the learner population. The study does not provide strong support for the coherence principle, primarily due to the wide range of responses received. This variability may be attributed, in part, to the demographic characteristics of the participants, particularly their age. It is apparent that younger individuals, who have grown up with exposure to rich media and intricate animations, tend to favor visually complex presentations, whereas participants from older generations tend to lean towards simplicity in their preferences.

5.6.2 Multimedia Principle

A significant majority of participants agreed with the Multimedia Principle, acknowledging that the incorporation of visuals and words in Multimedia OERs indeed contributes to faster learning and improved content comprehension compared to traditional text-based modules. Only a very limited number of participants disagreed

with this multimedia principle (3%). Therefore, this study contributes to the growing literature that proves multimedia principle to be true. It underscores the importance of embracing multimedia-rich educational approaches, particularly in the development of learning materials such as OERs, to optimize the educational experience and foster improved comprehension among learners in the distance learning set-up.

5.6.3 Signalling Principle

This suggests that the use of these visual aids in the lessons was generally well-received and perceived as beneficial in terms of guiding learners' attention to key information. Similar to studies that prove the validity of signaling principle in reducing cognitive load (e.g., Davis, 2018; Schneider et al., 2018; Sharma et al., 2019; Xie et al., 2017), this study corroborates the validity of the signaling principle. By corroborating the findings of these prior studies, the present research underscores the importance of signaling in instructional design, emphasizing its role in facilitating effective learning and minimizing cognitive load for learners. These consistent findings provide valuable insights for educators and instructional designers seeking to optimize the educational experience by leveraging the benefits of signaling within their teaching materials.

5.6.4 Spatial Contiguity Principle

Findings from this study suggests that the appropriate spacing between text and visuals, as guided by the Spatial Contiguity Principle, was well-received by the majority of respondents and contributed to their improved understanding of the lessons. Thus, aligned with the studies conducted in the field (e.g., Adesope & Nesbit, *Learning in the Digital Age: Implementing Mayer's CTML on Multimedia OERs for a MOOC* 119

2011; Alpizar et al., 2020; Höffler, 2010; Schroeder & Cenkci, 2018; Sundararajan & Adesope, 2020), the evidence from this study corroborates the said multimedia principle.

In essence, this research reinforces the importance of adhering to the Spatial Contiguity Principle when designing educational materials, highlighting its role in facilitating improved comprehension and learning outcomes among students. It underscores the significance of aligning spatial elements within multimedia presentations to enhance the overall effectiveness of educational content delivery.

5.6.5 Redundancy Principle

The data reveals a range of perspectives on the subject, indicating a diversity of opinions among the respondents. A significant portion of the participants found the combined use of audio and graphics to be effective, while others expressed varying degrees of disagreement or uncertainty regarding the necessity of word-by-word text in the narration. Consequently, this study offers only partial support for the principle advocating for the inclusion of word-by-word text in narration.

These findings are consistent with the recommendations made by Trypke et al. (2023), who suggest the strategic use of redundancy, a concept explored by Adesope and Nesbit (2011). Additionally, this study echoes the sentiments of Adesope and Nesbit (2005) and Wald (2008), highlighting the importance of incorporating a feature that allows learners to activate or deactivate closed captions for time-based media. This flexibility is essential as learner preferences and accessibility needs vary

significantly, emphasizing the importance of accommodating diverse learning styles and needs in multimedia educational content.

5.6.6 Segmenting Principle

The findings of this study in relation to this principle portrays a generally positive trend, with a substantial number of respondents perceiving a beneficial influence of timestamps and an interactive timeline on their learning experience, particularly in terms of breaking down complex concepts into more manageable segments. Therefore, this study provides empirical evidence of the ability of the segmenting principle to manage cognitive load, similar to Çeken & Taşkın (2022), Rey et al. (2019), and Noetel et al. (2021). Consequently, instructional designers and educators should consider integrating these segmenting principles into their self-paced instructional materials to better meet the learning needs and preferences of their target learners.

5.6.7 Temporal Contiguity Principle

Majority of the learners either agreed or strongly agreed that temporal synchronization is beneficial in enhancing their understanding and engagement with the content. Therefore, the data from the current study corresponds with the literature that substantiates the usefulness of the temporal contiguity principle in multimedia materials for MOOCs (Zee et al., n.d.). As such, it underscores the importance of meticulous timing and synchronization in optimizing the educational impact of time-based multimedia content, such as audios and videos, ultimately benefiting learners' understanding and engagement.

5.6.8 Personalization Principle

As opposed to the results of Ginns et al. (2013), this study does not support the validity of the personalization principle in multimedia learning in terms of using casual and conversational style of writing. This discrepancy might be attributed to the educational attainment and professional backgrounds of the participants. Notably, the course participant pool includes educators and professionals holding master's and doctorate degrees. As a result, their familiarity and frequent exposure to learning materials and readings characterized by an academic, advanced, and technical writing style rather than a conversational one, could potentially account for these findings.

5.6.9 Voice Principle

Based on the study findings, a substantial majority of respondents agreed that an authentic human voice in video voiceovers had a positive impact on their learning process and understanding of the covered topics and is preferred over an AI-generated voice. As such, the results of this study lend credence to the voice principle.

Nevertheless, it is worth noting that contemporary AI-generated voiceovers have made substantial strides in mimicking the nuances of human speech, including pitch variations, rhythmic patterns, and appropriate pauses. This advanced capability raises an intriguing point and warrants additional scrutiny. As such, further investigation is necessary to explore the extent to which AI-generated voices can replicate the qualities that make human narration preferable for learners. This examination will provide valuable insights into the ongoing evolution of AI technology

in the realm of multimedia learning and its potential to meet the expectations and preferences of learners.

5.6.10 Image Principle

Given that the item is inversely scored, a higher proportion within the disagreeing group implies that a majority of course participants finds greater learning efficacy in multimedia videos combining graphics, animation, voiceover, and text, as opposed to the talking head style showing the instructor's face and body. In essence, a multimedia approach prevails between the two approaches. However, those who adopted a neutral stance should be considered too. With everything factored in, the study provides partial backing for the image principle. This concurs with the findings of Kizilcec et al. (2015), wherein the discrepancy in preferences can be observed, with certain individuals demonstrating a proclivity for lecture videos featuring an instructor's face, while others prefer content devoid of a pedagogical image. The finding underscores the importance of catering to diverse learning preferences and recognizing that there is no one-size-fits-all approach when it comes to the incorporation of visual elements in educational videos.

5.6.11 Pre-training Principle

The data reflects a favorable result, with a substantial majority of participants (85.9%) agreeing or strongly agreeing that the course's pre-training content effectively introduced the foundational elements required for a comprehensive understanding of Media and Information Literacy.

The fact that such a substantial proportion of learners found the pre-training content beneficial implies that it effectively primed them with the fundamental knowledge and concepts essential for understanding the more complex aspects of the subject matter. This preparatory phase likely aided learners in managing the cognitive demands associated with the course, allowing them to approach the content with greater confidence and comprehension.

In essence, this study provides robust support for the value of pre-training in multimedia learning, highlighting its importance in easing the cognitive burden for learners tackling intricate subjects. It underscores the significance of adequately preparing learners before delving into complex materials, ultimately enhancing their learning experience and facilitating a more profound understanding of the topic.

5.7 Summary of the Results of Multimedia Principles

Principle	The extent to which it is supported by the study
Coherence Principle: Use simple text and visuals to the multimedia OERs as opposed to complex graphics and more intricate animations	Not supported
Multimedia Principle: The inclusion of visuals (graphics, animation, or image) and words in the Multimedia OERs shall lead to better learning compared to a traditional text-based module.	Fully supported
Signaling Principle: The highlights and formatting in the text and the signaling markers (arrows and circles) will help to direct the learner’s attention to the most important content of the lessons.	Fully supported

<p>Modality Principle: the combination of animation and audio narration is more effective in the learning process as opposed to animation and on-screen text in the videos</p>	<p>Partially supported</p>
<p>Spatial Contiguity Principle: The text and visuals that are adequately spaced towards one another (not too far and not too near) help learners comprehend the lessons about MIL better.</p>	<p>Fully supported</p>
<p>Redundancy Principle: The combination of audio voiceover and graphics in videos is adequate. A word-by-word text is not necessary for the narration.</p>	<p>Partially supported</p>
<p>Segmenting Principle: The timestamps in the videos and the interactive timeline in Google Course Site will allow the learners to learn the concepts in segments, thus making the topics more digestible.</p>	<p>Fully supported</p>
<p>Temporal Contiguity Principle: The synchronized timing of the audio voiceover, motion graphics, and text in the videos will facilitate the learning process of the topic these videos cover.</p>	<p>Fully supported</p>
<p>Personalization Principle: A casual and conversational style of writing in modules and speaking in videos instead of a formal academic language with complex vocabulary is more effective in facilitating the learning process.</p>	<p>Not supported</p>
<p>Voice Principle: An authentic human voice in the voiceover in videos will help learners learn and understand the topics better than an AI-generated voice would.</p>	<p>Fully supported</p>
<p>Image Principle: When it comes to instructional videos, learners will learn better from the combination of graphics, animation, voiceover and text alone rather than talking head videos that show the actual face and body of the presenter.</p>	<p>Partially supported</p>

<p>Pre-training Principle: The proper and adequate introduction of the topics will allow the learners to grasp the basic foundational definitions, terms, and concepts that are crucial for understanding the bigger picture of MIL.</p>	<p>Fully supported</p>
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Table 31: Summary of Results: Multimedia Learning Principles

In sum, seven multimedia learning principles are fully supported: multimedia principle, signalling principle, spatial contiguity principle, temporal contiguity principle, segmenting principle, voice principle, and pre-training principle. Three multimedia learning principles are partially supported modality principle, redundancy principle, and image principle. Two multimedia principles are not supported: the coherence principle and the personalization principle. The demographics of the MOOC learners played a huge role in these results.

5.8 Benefits of Multimedia Learning Materials Anchored on Mayer's CTML

B1: Motivating

The quantitative and qualitative responses of the learners further attest to this benefit. Participants reported feeling motivated to participate, study, and complete the course due to the engaging and high-quality materials.

Here are sample quotes from the responses:

- *I was not bored with the materials*
- *The multimedia material helped to be motivated to finish the course*
- *With the multimedia materials, my attention to the lesson is held much longer compared to if the modules only contained words. It is also enjoyable and does not make studying feel like such a chore.*
- *It motivated me to study it [the topic]. Because I see it is of very good quality and I know that much effort is put to make those things. So, it inspired me to learn more.*
- *This increased my motivation to participate and learn actively.*
- *It motivated me to finish reading the information.*

The synergy of the quantitative and qualitative results indicates that the utilization of multimedia-based OERs had a substantial positive impact on participants' motivation to actively participate in the course and fulfill its requirements. These resources were effective in driving engagement and completion. Therefore, this study provides partial evidence to the cognitive-affective theory of learning with media by Moreno. Motivation is a factor that mediates the willingness of the learners to learn the course, thereby affecting their cognitive states in absorbing the information.

B2: Visually Engaging

The quantitative data is corroborated by the analysis of the qualitative data. The visual appeal of multimedia materials emerged as a significant theme. Learners appreciated the modern and engaging design of materials, which made the learning

experience more interesting. The incorporation of graphics, colors, infographics, videos, and interactive components was noted for its ability to capture learners' attention and sustain engagement.

Sample actual quotes from the respondents:

- *Instead of solely relying on traditional text-based materials, the incorporation of multimedia elements such as videos, audio clips, and graphics has made the course content more visually appealing and easier to comprehend.*
- *Extremely well-made. Have never encountered such a level of design in a MOOC before.*
- *The multimedia presented in every lesson is very engaging and the graphics are superb!*
- *Multimedia materials used in the MOOC observed the elements and principles of art and graphic design well.*
- *The multimedia materials were also visually pleasing.*
- *“[W]ith the editing of the design for each slide, you will not be bored to read and you will be enticed to read more.”*
- *Visual aids and interactive elements not only facilitated comprehension but also sustained my engagement throughout the MOOC.*
- *Incorporating fun and aesthetically pleasing colors in publication materials, infographics, and modules [benefited me as a learner].*

Overall, the data analysis suggests that the integration of multimedia elements in the Open Educational Resources (OERs) was largely successful in presenting information in a visually appealing and engaging manner, which in turn stimulated participants' interest.

B3: Enriching the Learning Experience

Learners perceived the multimedia-based learning experience as fun, interesting, and engaging. The inclusion of various modes of interaction, activities, and visuals synergistically contributed to an engaging and enjoyable learning journey.

Sample quotes from respondents:

- *I'm thrilled that the course was just right for me! The learning experience was so interesting because they used videos, pictures, and interactive stuff that made learning super fun and engaging.*
- *The multimedia materials in this course have made my learning journey easier and even more fun. I could see that the brains and creatives behind the course materials invested a great amount of time and effort to execute their tasks with excellence. I am genuinely amazed[.]*
- *The multimedia materials are fun, engaging, and stimulating for people with a psychosocial disability, like me.*
- *It has provided me with a more engaging and interactive learning experience.*
- *Incorporating multimedia resources into a MOOC on Media and Information Literacy improves the entire learning experience by catering to diverse learning styles, encouraging engagement, and providing practical examples of how media literacy ideas are used in everyday life.*
- *The multimedia materials in the MOOC have greatly enriched my learning experience. Videos have made complex concepts clear and engaging, animations aiding understanding. Interactive simulations have allowed practical application, enhancing problem-solving skills. Audio clips, featuring experts and discussions, provided diverse perspectives. Overall, these multimedia elements have made learning dynamic, catering to various preferences and boosting comprehension.*
- *All the multimedia used in this course is well balanced which made learning much fun and easier.*

B4: Simplifying Complex Information

Participants praised how multimedia resources effectively simplified complex concepts. The intrinsic cognitive load required for the course is detected to be high in the course (see *Table 13*), yet the use of videos, animations, interactive simulations, and visual aids was highlighted as a means of making intricate ideas less complex and easier to digest.

Sample Quotes from Respondents:

- *Makes complex concepts become simplified.*
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- *Videos, animations, and interactive simulations made complex concepts clearer, enhancing my understanding.*
- *The use of videos, interactive quizzes, and visual aids helped me grasp complex concepts more easily.*
- *It's very simple, making it easy to understand*
- *Multimedia materials benefited me as a learner of MOOCs by explaining complex topics through visualization and module summary.*

B5: Efficient Absorption and Comprehension of Information

Respondents expressed that the diverse modes of multimedia, such as videos, infographics, and pictures, facilitated efficient absorption and comprehension of information. Learners noted that this approach made learning interesting and helped them to digest and understand course content better.

Sample Quotes from Respondents:

- *It helps me to understand better what is media and information literacy.*
- *The multimedia materials in the course greatly benefited me as a learner in this MOOC by offering diverse and engaging ways to absorb the content.*
- *The videos, infographics, and pictures helped me to understand every lesson of this course.*
- *Overall, the combination of visual, audio and texts provided in the course package is good enough to help learners to grasp the lessons easily.*
- *[T]he format helped make the module easier to consume.*
- *The multimedia materials helped to digest the data easily.*

B6: Easier Recall and Retention

The availability of downloadable materials and the integration of visuals with textual information were cited as factors that aided recall and retention. Learners emphasized that multimedia content, including images and infographics, acted as

memory triggers and contributed to better knowledge retention. Consistent with the multimedia learning theory by Mayer, the combination of images and text leads to better learning and retention due to the activation of multiple channels of information in the brain. The flexibility to revisit or download materials for later use was appreciated as a means of reinforcing learning.

Sample Quotes from Respondents:

- *If I need to learn again something that I forgot, I can just revisit or download the materials since they can also be downloaded.*
- *As a right-brain person, I like multimedia learning because I have been using it to enhance information retention and recall.*
- *Additionally, the use of multimedia has enhanced my retention and understanding of the subject matter, as it allows for multiple modes of information processing, catering to different learning styles.*
- *Combining visuals with textual information can significantly improve my memory retention compared to using text alone. Images serve as mental triggers, making it easier for me to associate concepts with visual representations.*
- *I like how they made it accessible when you have the option to download the materials and it has a summary. As a student it made them easier for me to remember it and access it when I don't have internet connection*
- *Downloadables helped me. I can go back to the infographics if I need to re-read something.*

B7: Caters well to visual learners

Respondents acknowledged the suitability of multimedia resources for visual learners. Infographics and visual elements were highlighted as effective tools for learners who preferred visual methods of learning. The adaptability of multimedia to diverse learning styles was seen as a strength of these resources.

Sample Quotes from Respondents:

- *I prefer this method because I am a visual learner and talking heads are somewhat boring.*

- *Different individuals have different learning preferences. Multimedia materials cater to various learning styles, allowing learners to absorb information through auditory, visual, and kinesthetic channels.*
- *I have a short attention span and reading lengthy texts makes me sleepy. With the use of multimedia materials in this course, I was able to learn important information without having to remember everything in the paragraphs. The infographics are well-designed and they contain simplified yet significant details.*
- *It [the multimedia materials] makes me visualize easier*
- *As an audio-visual learner, the instructional strategy of this and the other MOOCs from UPOU have been an easier means of acquiring knowledge as compared to conventional module based, text heavy lessons.*
- *I am a visual learner and with the infographics it became easy for me to navigate through the course.*

B8: Enhances Creativity

Participants highlighted that the use of multimedia materials induced their creativity. They felt inspired and challenged to create better presentations and produce more visually engaging learning outputs. Exposure to multimedia content encouraged learners to think creatively and apply design principles to their work, reflecting the potential impact of visual elements on creativity.

Sample Quotes from Respondents:

- *It gave me an idea on how to produce effective infographics by using cohesive colors, typography.*
- *It keeps me inspired to make multimedia materials like that in the course.*
- *The multimedia materials made me feel that I should also improve the learning materials I provide to my students.*
- *The quality of the learning process plus the multimedia materials challenge me to produce better presentations and produce better output in general.*
- *The course materials allow me to think creatively and produce artistic yet analytic output.*

B9: Beneficial for Future/Later Use

Some participants noted that the availability of downloadable materials allowed for future reference. The materials were seen as valuable resources that learners could revisit even after the course ended, contributing to long-term learning benefits. Additionally, they made the materials accessible despite not having an internet connection.

Sample Quotes from Respondents:

- *The multimedia materials are downloadable and it's helpful especially in the future if I want to review our past discussions*
- *I like how they made it accessible when you have the option to download the materials and it has a summary. As a student it made them easier for me to remember it and access it when I don't have internet connection.*
- *An added advantage is the ability to download the materials, allowing for offline access and reading convenience.*
- *[The course site] I will reread it when I have time in the future.*
- *I even saved those OERs for future references*
- *Aside from having a Google Site overview of the module, each modules are available for everyone to download - which makes it accessible to everyone who has difficulty with internet and to some that would like to use it for their future references.*
- *I downloaded the summary every after the module. With these it benefits me for another further readings in the future to refresh on what Media and Information Literacy is.*

5.9 Summary of Benefits

Summary of Benefits

- A positive trend can be observed from the results: an overwhelming number of learners had overall positive feedback on the Multimedia OERs in MIL MOOC.
- Multimedia learning materials anchored on Mayer's Multimedia Principles provide a multitude of benefits to the learners, including:
 - Increasing their motivation to participate in the course
 - Packaging and delivering the information in a visually appealing and engaging manner, thus stimulating interest
 - Offering opportunities for interactive activities, thus fostering engagement and understanding
 - Making learning experiences fun and engaging
 - Facilitating efficient absorption and improved comprehension of information
 - Enabling easier recall and better retention of learned content
 - Catering well to learners with visual and auditory learning styles
 - Enhancing creativity
 - Providing opportunities for future and later utilization of the learning materials even after the course/training has ended

5.10 Challenges with Multimedia Learning Materials Anchored on Mayer's

CTML

C1: Technical Errors and Issues

Navigating and accessing multimedia materials can present challenges for certain learners, especially the technologically challenged, on the lower end of the digital divide, and with fluctuating and unstable internet connection. The presence of persistent technical hindrances may hinder these individuals' ability to fully engage with the content and exploit the benefits of multimedia integration.

Specifically, students who are technologically challenged led to the errors in collaborative activities. In Mini-Activity 1 and 3, the students were prompted to use Canva Whiteboard and Google Spreadsheets in their contributions. Not all students are adept with the tools, hence the errors in these activities. To address this issue, the course coordinator (researcher) made the decision to transform the activity format into Discussion Forums, aiming to reduce the likelihood of errors occurring.

C2: Visually overwhelming and distracting

A recurring theme in the feedback revolves around the dichotomy between learners who gravitate towards simplicity and those who resonate with elaborate graphics. Those who prefer a reading and writing-centric learning style expressed their discomfort with the prevalence of infographics.

One participant elaborates:

I do not like infographics. I prefer simple texts. So I had to encode the lessons every time because there was no summarized text version of the lessons. I wish there was an option to have the simple text version of the modules.

Infographics are fine for those who like it. How about those who are not used to it?

Others had similar sentiments:

- *Mostly distracting and overwhelming design elements*
- *Should limit the use graphics in the materials and make it simple text to ensure it is not too distracting whilst focusing on the content itself*
- *The constant barrage of flashy animations in the course's multimedia materials ended up being distracting and overwhelming, making it challenging to focus on the key concepts being presented.*
- *[P]erhaps for learners with special needs, there might be components that will be distracting or overwhelming because of the bold colors used.*

Therefore, in order to cater to all learning styles and needs, a simple yet neatly designed text-based document containing the lessons and activities should be available to those who prefer simplicity over visual-laden learning materials.

C3: Internet Connectivity

Some respondents in areas with weak internet connections experienced troubles in accessing and loading the Multimedia OERs. Multimedia files such as videos, images, and websites typically require a high bandwidth due to their high quality and hence, big file size. Therefore, compressing the file size of high-quality multimedia files while maintaining high resolution is recommended.

Sample quotes from respondents:

- *Living in the province my only issue is the internet connection.*
- *[T]he internet connection is mainly my problem during this course because I have to wait for it to be able to access it (Course materials).*

C4: Displeasing Color Scheme and Typefaces

Regarding the font styles and color palette, the feedback from participants suggests that there are notable concerns and preferences within the learner community. The color scheme of University of the Philippines leans toward dark hues. Meanwhile, its typefaces are boxy-type with sharp edges. Participants have expressed challenges related to readability and focus, specifically mentioning difficulties with the font and color choices in the course materials. Some respondents found certain colors glaring and problematic for text legibility, while others suggested gentler color palettes and increased white space for a more visually comfortable experience. It is also worth noting that participants mentioned the potential impact of age on their perception of color intensity, with one respondent at the age of 51 expressing discomfort with the colors used. These sentiments are consistent with the finding of Münchow et al. (2017), in which warm colors and rounded shapes are favored by learners. These responses highlight the importance of thoughtful design considerations in font styles and color palettes to ensure an effective and visually appealing learning environment.

Notably, this specific finding provide support to the Cognitive-Affective Theory of Multimedia Learning by Mayer and Moreno. The participants' comments about certain colors being glaring and causing discomfort reflect affective aspects of learning. Affective factors, such as emotions and preferences, play a role in how learners engage with multimedia materials. Colors and design can evoke emotional responses, impacting the learners' overall experience and motivation to engage with the content.

Sample quotes from respondents:

- *The font and color of the references on the end on each module. I find it hard read.*

- *I'd like to change the color or font style I guess. To make it a little soft in the eyes. I learned a lot and the color may only be too bright for me and the sharp corners gives me a bossy vibe*
- *Mostly on design aspects as the colors can be glaring or makes it difficult for me to read or focus on the text/information.*
- *[T]ry more gentle colors and whitespaces for some instances.*
- *Although the designs are really good, it can sometimes make me or other readers feel bored because the colors or elements all throughout the course are somehow similar. Colors were too much for my eyes, too. I'm 51 years old.*

5.11 Summary of Challenges

Summary of Challenges

- Despite the multitude of benefits, the multimedia learning materials that incorporate multimedia learning principles by Mayer still posed some challenges on the learners' end:
 - Confronting technical errors
 - Overwhelming visual content that could distract those inclined towards a reading/writing learning style and a preference for simpler materials
 - Internet Connectivity problems and delays when trying to load multimedia materials with large file sizes
 - Displeasing color scheme and typefaces

VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The study contributes to the growing literature on multimedia learning initiated by Richard Mayer. Within the context of Massive Open Online Courses, it investigated the extent of how the application of the 12 Multimedia Principles into Open Education Resources (OERs), which are free to be reused, repurposed, and shared, can facilitate the achievement of learning outcomes, as well as decrease the cognitive load it takes to learn a concept with a high intrinsic cognitive load (ICL) – Media and Information Literacy. The Multimedia OERs designed for this MOOC have effectively reduced the Extraneous Cognitive Load. Meanwhile, Germane Cognitive Load is partially reduced. All 20 (twenty) learning outcomes are fully achieved in the course, based on the quantitative and qualitative data.

Seven multimedia learning principles are found to be fully supported by the empirical results of this study, namely: multimedia principle, signalling principle, spatial contiguity principle, temporal contiguity principle, segmenting principle, voice principle, and pre-training principle. Meanwhile, three multimedia learning principles are partially supported: modality principle, redundancy principle, and image principle. Lastly, two multimedia principles are not supported: the coherence principle and the personalization principle. Therefore, although beneficial, not all multimedia learning principles are universally applicable in all learning situations and environments. Instructional designers and course coordinators should take this finding into account when designing digital learning experiences and materials for adult learners.

The difficulties encountered by the students on the remote learning set-up, such as incapability to learn independently, struggles in staying motivated and focused, and

low reading comprehension can be overcome by making the learning materials visually engaging, fun, coherent, and interactive by incorporating the multimedia principles. These materials, which are their primary method in imbibing knowledge, should be anchored on learning principles that aim to optimize the learning experience and process for independent and self-paced learners. They have different needs from those who are learning face-to-face. Moreover, their learning styles and preferences differ. Thus, learning with multimedia, as it offers various modalities in presenting information is a great opportunity to cater to various learners' profiles.

Overall, despite the challenges, the endeavor to integrate Mayer's Multimedia Principles into Open Educational Resources (OERs) and deliver them through a Massive Open Online Course (MOOC) has proven to be successful. The initiative attracted a total of 2983 participants, with 802 successfully advancing to the final project stage. Notably, the completion rate stands at 29.89%, a remarkable achievement considering that the average completion rate for UPOU's MOOCs does not exceed 20%. The sheer number of positive feedbacks from learners, both in terms of qualitative remarks and quantitative data, unequivocally underscores the MOOC's impact on the daily and professional lives of most learners who completed the course.

Based on the challenges faced by this study, the researcher recommends the following in designing Multimedia learning materials: (1) Include little to no external links that will deviate the learners from the current page as this might distract them instead of enriching their knowledge; (2) Since not all are fond of visual-heavy and multimedia-based learning, provide an option for a plain text-based version of the lecture/topics. Alternatively, make it visually simple yet still neatly designed to not

overwhelm the eyes; (3) Use color schemes that are easier on the eyes. If adhering to certain branding guidelines is inevitable, balance the color combination with grayscale colors; (4) Take note of the technological proficiency of the learners who will be enrolled in the course. Refrain from collaborative activities that require advanced skills in a certain application or software without providing step-by-step instruction and a video-based demo on how to accomplish the activity; and (5) carefully decide which multimedia principles will be the most applicable to the course and its learners. Not all twelve principles apply to a specific learning context.

Additionally, it is highly suggested that a more accurate scale to quantify cognitive load/mental effort be developed and used by researchers in this field. The original thought is easily lost in translation. Ergo, a non-translated English version of the cognitive load scale originally written in German and developed by Klepsch et al. (2017) should be designed for standardization purposes. It would be much better if qualitative methods will be used, such as in-depth interviews, were utilized to assess and analyze the cognitive load of participants.

Lastly, since this study is conducted within the parameters of learners' sentiments, achievement of learning outcomes, and experiences within the MOOC set-up. It does not encompass data collection from key stakeholders involved in the implementation of multimedia-based learning. Thus, in the future, studies on Multimedia Learning Principles should be held from the perspective of multimedia practitioners, instructional designers, and course coordinators to factor in its feasibility, additional costs, and possible benefits and challenges in wide implementation.

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VIII. APPENDICES

APPENDIX A: PRE-TEST OF LEARNING OUTCOMES

About this Survey (Read before you proceed)

- Data from this survey will be utilized for an undergraduate study. Answering this survey is optional. However, it is highly recommended to answer this to gauge your skills and knowledge prior to the course.
- You should take this survey **before** engaging with the learning materials (infographics and course pack), preferably before the first day or first week.
- A **post-test** will serve as a follow-up that will be open during the last week of class. If you answered this survey, make sure to answer that as well.

Presently, I can...

Define Media and Information Literacy and its related concepts in my own words. ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Explain the relationship of information to data, knowledge, and wisdom ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Describe the contemporary Philippine media landscape and the current issues it faces. ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Examine how media literacy, information literacy, and technology literacy both differ and relate to one another ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Differentiate between an influencer and a journalist ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Identify the different types of information disorder ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate the types of disinformation ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Discuss how to call out family members who share false information on social media ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Identify the selection criteria in assessing information ⓘ

A Great Deal A Lot Somewhat Just a Little Not at All

Analyze each information source by asking the right questions

A Great Deal A Lot Somewhat Just a Little Not at All


Filter information in terms reliability, credibility, and accuracy

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A Great Deal A Lot Somewhat Just a Little Not at All

Decide for myself which information sources are the best and most suitable for my needs

A Great Deal A Lot Somewhat Just a Little Not at All

Define responsible digital citizenship 


- A Great Deal A Lot Somewhat Just a Little Not at All

Determine ways on how to fact-check 


- A Great Deal A Lot Somewhat Just a Little Not at All

Know how I can protect myself from scams and data privacy issues online. 


- A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate various factors that affect the media and information I consume 


- A Great Deal A Lot Somewhat Just a Little Not at All

Identify the proper process behind the creation and sharing of information 


- A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate Philippine Laws that regulate free speech 

- A Great Deal A Lot Somewhat Just a Little Not at All

Determine visual design principles and elements 

- A Great Deal A Lot Somewhat Just a Little Not at All

Design a media product that is well-researched, properly gives attribution and credits to others, and adheres to aesthetic design principles 

- A Great Deal A Lot Somewhat Just a Little Not at All

What do you expect from the class that you do not know now?

What do you expect to be able to do at the end of the course that you cannot do now?

Please rate your interest in the subject matter 

- Extremely
 Very
 Moderately
 Slightly
 Not at all

Please comment on how you expect this material to integrate with your studies, career, and/or life?

APPENDIX B: Post-test of Learning Outcomes

Presently, I can...

Define Media and Information Literacy and its related concepts in my own words. **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Explain the relationship of information to data, knowledge, and wisdom **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Describe the contemporary Philippine media landscape and the current issues it faces. **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Examine how media literacy, information literacy, and technology literacy both differ and relate to one another **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Differentiate between an influencer and a journalist **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Identify the different types of information disorder **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate the types of disinformation **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Discuss how to call out family members who share false information on social media **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Identify the selection criteria in assessing information **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Analyze each information source by asking the right questions

A Great Deal A Lot Somewhat Just a Little Not at All

Filter information in terms reliability, credibility, and accuracy

A Great Deal A Lot Somewhat Just a Little Not at All

Decide for myself which information sources are the best and most suitable for my needs **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Define responsible digital citizenship **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Determine ways on how to fact-check **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Know how I can protect myself from scams and data privacy issues online. **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate various factors that affect the media and information I consume **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Identify the proper process behind the creation and sharing of information **!**

A Great Deal A Lot Somewhat Just a Little Not at All

Enumerate Philippine Laws that regulate free speech **!**

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A Great Deal A Lot Somewhat Just a Little Not at All


Determine visual design principles and elements **!**


A Great Deal A Lot Somewhat Just a Little Not at All


Design a media product that is well-researched, properly gives attribution and credits to others, and adheres to aesthetic design principles **!**

A Great Deal A Lot Somewhat Just a Little Not at All

After engaging with the learning materials in this course (videos, infographics, and course pack), what have you learnt from this course that you used to not know? 

After engaging with the learning materials in this course (videos, infographics, and course pack), what are you able to do now, which you are not 100% sure that you can do before? 

Please comment on how you will integrate the skills and lessons you learned from the learning materials with your studies, career, and/or life? 

Were there any particular learning material from the course (video, infographic, and course pack) that you found to be helpful in achieving a learning outcome in the course? If yes what are these? (Type N/A if there's none). 

APPENDIX C: Course Survey and Feedback Form

About this Survey

- This survey takes **at least 30 minutes** to complete.
- It has a mix of several Likert-scale and open-ended questions about your overall experience in the course, together with your learning experience with the multimedia OERs.
- For the open-ended questions, **answering in English, Tagalog, or Taglish is acceptable.**
- **Answering as thoughtfully as possible is highly appreciated** since the results and data from this survey will be utilized for an undergraduate capstone project.
- Although this survey composes 5% of your grade, this is **optional** and **voluntary**. Given that you fulfilled all course requirements, you will still be given a certificate if you choose not to participate in this survey.

1. Name (Optional)

2. Sex [!]

- Male
 Female
 Prefer not to say

3. Age [!]

- 20 and below
 21-30
 31-40
 41-50
 51 and Above

4. Employment Status [!]

- Employed
 Unemployed
 Student
 Self-employed

5. Do you have an experience in enrolling in MOOCs in the past? [!]


- Yes
 No

6. Your Current Geographical Location [!]


- Philippines
 Abroad

7. Highest Educational Attainment [!]

- Some Elementary
 Elementary Graduate
 Some High School
 High School Graduate
 Vocational or any two-year degrees
 Some College Units
 College Graduate
 Some Masters Degree units
 Masters Degree
 Some Doctorate units
 Doctorate Degree

8. What is your learning style? 

- Visual learning style - you prefer the use of images, graphics, and visuals to access and understand new information.
- Auditory learning style - you understand new content best through listening, speaking, and reading aloud.
- Kinesthetic learning style - you learn best through figuring things out by hand and acting out scenarios.
- Reading/Writing - you learn best through words. You prefer readings and taking notes while studying.

9. What motivated you to enroll in the course? 

10. How did you discover this short course? Choose one or more. 

- Social Media (Facebook, Instagram, Twitter, etc.)
- LinkedIn
- Search engine (Google search)
- Friend or Acquaintance
- Website of UPOU
- Blogs or publication
- Other

With **7 being the highest (Absolutely Wrong)** and **1 being the lowest (Absolutely Right)**, please rate the following based on the impact of **multimedia Open Education Resources (OERs) in the course: course package, infographics, videos, and summary slides** – to the cognitive load and mental effort it took you to understand the topics and do the activities in this course.

11. Several things are needed to be kept in mind all at once when it comes to learning with the Multimedia OERs 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

12. The Multimedia OERs are very complex. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

13. With the Multimedia OERs, I made a huge mental effort to understand the details and the overall context of the topics and lessons. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

14. My primary goal while learning with the Multimedia OERs is to understand everything accurately. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

15. The Multimedia OERs consisted of elements that supported my comprehension of the topics and activities. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

16. I find it exhausting to find the important information in the Multimedia OERs. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right


17. The design of the Multimedia OERs is very inconvenient for learning. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

18. It was difficult to recognize and link the crucial information in the Multimedia OERs. 

- (7)Absolutely Wrong (6) (5) (4) (3) (2) (1)Absolutely Right

Please rate your level of agreement with the following statements with regard to the **multimedia OERs in the course: course package, infographics, videos, and summary slides** – in the course.

19. I prefer simple text and visuals to the multimedia OERs as opposed to complex graphics and more intricate animations. 

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

20. The inclusion of visuals (graphics, animation, or image) and words in the Multimedia OERs helped me learn faster and understand the content more effectively compared to a traditional text-based module. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

21. The highlights and formatting in the text and the signalling markers (arrows and circles) helped to direct my attention to the most important content of the lessons. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

22. I would prefer the combination of animation and audio narration as opposed to animation and on-screen text in the videos presented in this course. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

23. The text and visuals in the course materials are adequately spaced towards one another (not too far and not too near), helping me to understand the lessons about MIL better. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

24. I think that the combination of audio voiceover and graphics in videos is adequate, a word-by-word caption is not necessary to the videos. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

25. The timestamps in the videos and the interactive timeline in Google Course Site allowed me to learn the concepts in segments, thus making the topics more digestible. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

26. I think the timing of the audio voiceover, motion graphics, and text are synchronized in the videos, which facilitated my learning process of the topic it covers. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

27. I think a formal academic language with complex vocabulary instead of a casual and conversational style of writing in modules and speaking in videos are more effective in facilitating my learning process. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

28. An authentic human voice in the voiceover in videos helped me to learn and understand the topics better than an AI-generated voice would. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

29. When it comes to instructional videos, I think I would have learned better from talking head videos that show the actual face and body of the presenter rather than the combination of graphics, animation, voiceover and text alone. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

30. I think the course properly and adequately introduced the topics, allowing me to grasp the basic foundational definitions, terms, and concepts that were crucial for me to understand the bigger picture of MIL. **!**

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Please rate the following based on the **possible benefits of multimedia OERs in the course: course package, infographics, videos, and summary slides** to you as a learner.

31. Did the use of multimedia-based OERs enhance your motivation to actively participate in the course and finish the requirements? **!**

- Not at all
- Somewhat
- Moderately
- Mostly
- Very much

32. Did the OERs effectively integrate multimedia elements (such as text, images, videos) to present information in a visually appealing and engaging manner which stimulated your interest? **!**

- Not at all
- Somewhat
- Moderately
- Mostly
- Very much

33. Did the OERs offer opportunities for interactive learning activities (e.g., quizzes, simulations, discussions) that fostered your engagement and deepened your understanding? **!**

- Not at all
- Somewhat
- Moderately
- Mostly
- Very much

34. Did the OERs provide access to additional resources or references that complemented the course content and enriched your learning experience? **!**

- Not at all
- Somewhat
- Moderately
- Mostly
- Very much

35. Please comment on other ways that the multimedia materials in the course benefited you as a learner in this MOOC. **!**

Please rate and answer the following based on the **possible challenges of multimedia materials in the course: course package, infographics, videos, and summary slides** to you as a learner.

36. How often did you encounter any technical difficulties or issues while accessing or navigating the OERs?¹
 Never (0 times) Rarely (1-2 times) Sometimes (3-4 times) Always (5-6 times) Often (7 times above)

37. Were there any aspects of the Multimedia OERs that you found confusing or difficult to understand? If yes, please specify. Type N/A if there's none.¹

38. Did you face any challenges in aligning your learning preferences or styles with the design of the course materials? If yes, what are these? Type N/A if there's none.¹

39. Have you noticed any instances where the multimedia components of the course were distracting or overwhelming, rather than helpful? If yes, provide details below. Type N/A if there's none.¹

40. Please comment on other challenges you encountered in the course, specifically about the Multimedia OERs in this MOOC. Type N/A if there's none.¹

Please rate and answer the following based on your **overall experience in the course.**

41. There is a clear statement of the course objectives and goals.¹
 Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

42. Teachers and technical support staff are available to cater the needs of students.¹
 Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

43. My level of skills and knowledge improved at the end of the course.¹
 Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

44. The course content is logically organized.¹
 Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

45. The course is designed to be finished within the expected duration.¹
 Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

46. In the scale of 1-5, 5 being the highest, how will you rate your experience of the course site?¹
 1 2 3 4 5

47. In the scale of 1-5, 5 being the highest, how will you rate this course as a whole?¹
 1 2 3 4 5

48. What problems did you encounter in taking this MOOC? How did you overcome them?¹

49. Do you have any other suggestions or recommendation to improve this course?¹

50. ¹

I hereby grant permission to the University of the Philippines Open University and its representatives to collect and process my personal information, including my name and my affiliation for academic and institutional purposes, and to the retention of such information for as long as they are necessary for the fulfillment of the above purposes. I understand that my information shall be processed both by way of computer media and on paper, in compliance with the rules in relation to personal data protection, and that my information shall be transferred or disclosed to the abovementioned institution and its representatives. I understand that, at least with respect to my personal information, I have the right to access, the right to make corrections, the right to object to the processing, the right to have information erased or blocked, the right to be informed of the existence of processing, the right to damages, and the right to lodge a complaint before the National Privacy Commission. I further attest that I have read this consent form and fully understand the contents thereof.

¹ Required

Continue