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Multidisciplinary Aspects of Design

Objects, Processes, Experiences and Narratives

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Conversation Design for Raising Awareness on the Responsible Use of the Internet

Co-design of a Chatbot Game with Secondary School Students

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Abstract. The rapid process of digital transformation and servitization experienced on a global scale in recent decades, further accelerated by the pandemic crisis, has radically altered the life experience of societies, with technological innovations leading to the emergence of new ethical and legal challenges. The issue of digital literacy and the acquisition of basic skills for responsible use of the internet has become one of the most urgent prerogatives in international government programs to address psychosocial phenomena such as those related to online grooming, cyberbullying, cybersuicide, cyber racing, or online scamming. The proposed work introduces the use of participatory game design as an empowerment tool for young students. The case study of the NetWalking project, developed by an interdisciplinary team of practitioners and researchers in several secondary schools in the city of Palermo (Italy), describes the experimentation of co-design activities of an edugame with a conversational interface (chatbot), which exploits the logic of nonlinear storytelling to actively engage students in playful learning activities, contributing to the development of hard skills (STEM) and soft skills (self-assessment, teamwork and information management).

Keywords: Conversation Design · Chatbot Game · Nonlinear Storytelling · Digital Literacy

1 Introduction

1.1 Education and the Internet Psycho-Social Phenomena

Digital technologies today structure a new way of being in the world, where old social phenomena manifest themselves in a new guise. A radical paradigm shift is taking place that is difficult to comprehend [1]. The contemporary subject depends on the digital medium just as it did over a century ago with electricity [2]. In the constant neotenic process of the individual, "*it is we who adapt to technology and not the other way around*" [3]. The relationship with the digital is structuring a new subject that tends toward the

post-human[1][4]. The pervasiveness of the relationship with the digital medium acts not only on the structural level of the subject but also on the relationship with the (Symbolic) *Other* and with the "*Real*".[2] The dissolving of the boundaries between Real and Virtual ferries the subject into an unprecedented relationship with the existing. In this framework, contemporary adolescence becomes an embodied metaphor for the new relationship with the existing. It cannot be read as a pathological and deviant expression of a new way of being in the world but as an effect of contemporary civilization.

The relationship of adolescents with the digital medium seems to be located more in the dimension of being rather than that of use. The adolescent "exists" on the web, not uses it. We witness a process of generalized digitization of daily life [5], which exposes the subject to the possibility of failing to construct a psyche endowed with intimacy and to preserve its singularity. One wonders whether with the advancement of technology, humans are endangering their existence [6] or whether digital information and communication technologies can be likened to new *pharmakons* (poison and antidote) [5] whose toxic effects can be reversed under technological conditions of possibility.

Starting from the concept of "*onlife*" [3], which describes the attitude of contemporary hyperconnected societies not to distinguish between online and offline life, the research proposed here investigates the potential of service design and game design in the development of technological solutions and game experiences that can strengthen the competence and awareness of young people in the use of new media, starting with generations X and Z, who are more exposed to web-related risks. Indeed, there is evidence that a game can confer psychological resilience against online risks, such as misinformation and fake news [7], or induce behavioral change in health [8]. Thus, edugames can provide young learners with cognitive training on a general set of techniques, skills, and competencies that can be spent in different domains.

1.2   Learning by Designing: Game Design and Pedagogy

In addition to the value that the game provides in a direct way to its players in the use phase, this research aims to show the value that can also potentially be generated by the co-design and co-creation phases of the game itself with students through a pedagogical method that uses technology and encourages active learning through design techniques [9]. Game design can be used as an effective form of learning [10] to foster additional motivation and increase students' research knowledge and awareness of digital tools. In the case presented in this study, the game also incorporates the principles of decision-based pedagogy (DBL), which assume that knowledge is contextualized, conditional, and schematized to facilitate memorization and retrieval [11]. Indeed, using a nonlinear narrative in the game based on decision trees stimulates a procedural mode of learning by fostering problem-solving aptitude and the development of critical and lateral thinking [12]. In addition, the learning-by-challenge mechanism, as opposed to traditional expository learning, also promotes a higher level of social interaction

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[1] *Post-human* is a neologism that focuses on the emergence of certain general trends in the construction of new coordinates for defining human subjectivity.

[2] Here we are referring to the *Real* in the Lacanian sense, which constitutes along with the *Symbolic* and the *Imaginary* one of the three psychic registers theorized since the 1950s.

among students and the strengthening of conflict management skills [13]. Game-based learning and above all "Digital game making enacted through "*production pedagogy*"[3] *can leverage dynamic learning opportunities, [...] offering critical alternatives to aridly disengaging forms of digital literacies instruction in schools*" [14]. In a world where students are increasingly digitally connected to mobile devices, educators require new models of engagement and approaches to teaching and learning. Gaming, configuring itself as an immersive experience in which to test one's skills, is one of them.

With particular reference to digital games, learning based on playful experiences results in greater engagement in learning, a better understanding of course content, increased ability to concentrate, improvements in problem-solving, and higher academic achievement [15]. In fact, this mode of learning mirrors what is already structured in young people from an early age in nonformal settings.

Educational content can be conveyed by different types of games: Serious Games - designed for purposes other than entertainment -; Educational Games (or *Edugames*) - designed to support educational activities in formal education -; and Games for Learning - with educational purposes but used in informal education and vocational training contexts - [16]. The game developed during the research is positioned between an Edugame and a Game for Learning because, although some phases and activities were carried out in the school environment, it remains available for use by a general audience, even outside the formal educational context. Serious Games, Edugames, and Games for Learning can make use of analog and digital media, but today Mobile Gaming is certainly the most popular mode[4]. Finding its assumptions in text adventures[5], Chatbot Games take the form of a particular subcategory of gaming that primarily exploits text and multimedia content (images, audio, short videos). There are two macro-types of chatbots: those that integrate NLP[6] and rule-based ones. In the former, Artificial Intelligence (AI) understands the context and automatically processes user interactions, while in the latter (used in this study), the system responds to input exclusively through a set of predefined rules.

1.3 Literature and References

The scientific literature on serious games for promoting digital skills is extensive and growing [17]. It shows a wide spectrum of possible connections between learning and game mechanics, depending on the specific goals to be achieved: acquisition of knowledge, aptitude, competence, or experience [18]. In the field of education, there are several examples of chatbot games, such as those developed for the Circuit of Museum Houses

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[3] *"Production pedagogies are premised on the view that people learn best, and most deeply, through designing "networked" cultural artifacts that have use value, and that matter to their makers"* (Thumlert et al., 2018).

[4] 54% of gamers use smartphones while 35% of them use game consoles. Source: Statista, 2022.

[5] A text adventure can be considered both a literary work and a video game. It is necessary to use text to maneuver the characters who interact with their environments.

[6] Natural Language Processing (NLP) refers to the branch of computer science, and specifically that of artificial intelligence, interested in providing computers with the ability to understand text and spoken words the same way as humans do. Source: IBM.

in Milan[7] or the Anne Frank Museum in Amsterdam[8]. In the case of the experience conducted in Palermo, the main reference was the game "*Bad News*",[9], which, by introducing the theory of inoculation[10] within the play environment, demonstrated how the game can help critically improve players' digital skills in recognizing and analyzing fake news [7]. Within NetWalking, the mechanics of the metagame, competition, and simulation were used to stimulate players' motivational levers with quizzes, quests, and puzzles useful in recognizing key internet dangers such as phishing, grooming, and cyberbullying.

2 Case Study

2.1 NetWalking Game: Context and Concept

The NetWalking project[11], developed by an interdisciplinary team consisting of psychologists, pedagogists (Lega Contro la Droga Onlus), and designers (PUSH), was implemented within 6 schools[12] and 4 neighborhoods of the City[13]. The intervention involved experimenting in schools with game co-design activities, which were subsequently presented and tested not only in schools but also in the neighborhoods. The objective of NetWalking was to enhance in the target group some of the key competencies for lifelong learning expressed by the European Council: technological, digital, and learning-to-learn competencies[14]. 48 teachers and 390 students (223 F; 167 M) between the ages of 11 and 21, divided into 15 classes, were directly involved.

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[7] Developed by the Invisible Studio agency.

[8] Used as an integrative support for the museum storytelling: https://www.annefrank.org/en/about-us/news-and-press/news/2017/3/21/anne-frank-house-launches-bot-messenger/

[9] Developed by the Dutch media agency DROG together with researchers from the Cambridge Social Decision-Making Lab.

[10] Social-psychological theory introduced in 1961 by American psychologist W.J. McGuire, which uses the analogy of medical inoculation to show that through preexposure to weakened versions of a stronger future threat, personal attitudes or beliefs can be protected from intentional acts of persuasion or malevolent influences, in exactly the same way that a vaccine protects a body from certain diseases.

[11] Funded by the Prime Minister's Office of the Italian government, Department for Anti-Drug Policies - started in March 2018 and ended in September 2020.

[12] I.C. Florio San Lorenzo; Istituto Magistrale Statale "Regina Margherita"; Istituto Professionale di Stato per i Servizi di Enogastronomia e l'Ospitalità Alberghiera "Pietro Piazza"; Istituto Superiore Statale "Francesco Ferrara"; Ente di Formazione Professionale FAE – Form Azione Europea.

[13] Oreto - Central Station; Kalsa - Foro Umberto I; Tribunale - Politeama; Mondello - Valdesi. The activities, structured with a non-formal methodology, aimed at engaging adolescents as a function of raising awareness of the project theme and subsequently to test the Edu-game.

[14] *"Council Recommendation on key competences for lifelong learning"*, The European Union Council (2018).

2.2   Design Methodology

2.2.1   Surveys: User-Research

The research phase was conducted both in schools and in the local area through preliminary interviews and the administration of questionnaires (526), aimed at detecting the state of the art about adolescents' use of the Web and the main polarizations of interest related to the web services and social networks. The questionnaires were also used to determine the target group's level of knowledge and awareness of the main risks and dangers associated with the Internet.

Adolescents were asked to answer questions about their online habits (connection time, sites visited, apps used, moods during use, interference with other areas of their daily lives) and offline habits (hobbies, reading, studying, sports, etc.). The average time spent online (5/7 h per day, often at night), the type of device predominantly used (smartphones and game consoles), and the main types of apps used (social networks, chat, and dating apps) were recorded. Also particularly interesting is the percentage of adolescents who have never read a book (22% F; 47% M) and the way they inform themselves about news events (almost all exclusively through headlines appearing on social media often without opening the links, reading the content and/or ascertaining the veracity of the sources). The qualitative analysis confirmed a low level of soft skills among the students involved in the study.

2.2.2   Focus Groups: Interests and Topics

Following the administration of the questionnaires, focus groups were conducted in plenary mode and in individual classrooms to identify topics of greatest interest to the students to be used as cues for the design of the stories and game dynamics. The focus groups were structured in such a way as to put the participants' words at the center and enhance the singular experience. This allowed the teens to interweave their own narratives with those of the *Other* and to construct an unprecedented shared narrative of contemporary adolescence. The stance taken by the presenters, in addition to being geared toward accommodating all the issues that emerged, served the function of incentivizing deepening, so that commonplaces and clichés were deconstructed by the participants themselves. The focus groups highlighted the number of pitfalls and risks to which teens are exposed during their surfing hours (revenge porn; body shaming; sexting; sextortion; grooming; account and data theft; dissemination of private content; cyberbullying) and how many requests for help circulate predominantly within the peer group, given that the adult figure is not always a reference point for young people to turn to.

2.2.3   Co-design Workshops: Non-linear Storytelling and Decision Based Learning

Through the open-source software *Twine*, students collaboratively created diagrams, structures, and dialogues of nonlinear stories online. They created and embedded multimedia content (text, images, audio, video, gifs) in the stories to develop interactive game experiences (Fig. 1). The choice of nonlinear story mechanics is due to its close connection with the pedagogical methodology of decision-based learning. This methodology integrates theoretical and notional knowledge with a procedural and conditional one, a

type of functional and practical knowledge applied to concrete problem solving through decision trees [11]. Designing a story with several possible end scenarios stimulates the students to sift through all the possibilities of solving a problem and to create their own hierarchy of values through which to define some scenarios as "right" and others as "wrong," thus establishing an ethical and critical stance in the face of complex issues such as, for example, the relationship between young people and digital media.
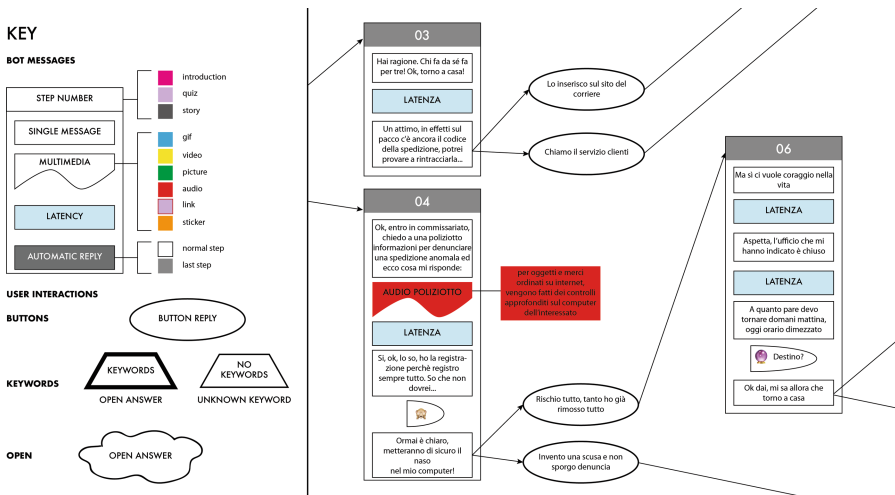

Fig. 1. Conversation diagram: legend and detail of some forks with examples of choices and interactions (original messages in Italian language).

2.2.4 Prototyping: From Diagrams to Chat

The creation of animated prototypes, tested together with students and teachers, enabled collaborative reasoning about the construction of the decision trees that form the backbone of the different story plot alternatives. The game was structured in three parts: introduction, quiz, and nonlinear story.

The introduction is intended to make initial contact with *Walker*, the protagonist, who speaks in the first person to the player. During the introduction, the concept of chatbots is clarified and the limits of character interactions are established. The whole game revolves around the idea of a challenge, (*#walkerchallenge*), which is thrown at the player so that the true identity of the protagonist is discovered. The introduction confronts the player with the so-called "magic circle": the imaginary threshold one crosses when preparing to participate in a game, which gives the dimension of what is fiction and what is not[15]. It was chosen to leave the boundaries of the *magic circle* very labile to purposely accentuate the game-reality ambiguity.

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[15] The concept of the "magic circle" is described by Dutch historian and linguist Johan Huizinga in "*Homo Ludens*" as a temporary world in which the rules of play rather than those of real life apply.

Fig. 2. Typical screens of the conversation: introduction and quiz (translation in notes). (1st screen: *"Hi* [name_user]*, you also ended up in my challenge?* [Toy Story meme about challenges] *It is actually the first to land on telegram! Who told you about me?";* 2nd screen: *"This is not the usual stuff you find on YouTube. I programmed this bot you are talking to, to propose you some choices, and only some of them will lead you to actually talk to me. By the way* [Backhand Index Pointing Up emoji]*, let's start with the basics. You know what a chatbot is, right?* [1st answer: Thumbs Up] [2nd answer: Thumbs Down]; 3rd screen: *"This story is honestly crazier than mine… A clique of scammers created all these fake profiles to lure single women who were extorted for thousands of euros* [Face Screaming in Fear emoji]. *Do you know in what year a person was first sent to court for the crime of phishing?* [1st answer: *"1991"*]; [2nd answer: *"1999"*]; [3rd answer: *"2004"*]; 4th screen: *"That's right* [Beaming Face with Smiling Eyes emoji]. *Just think that the convict was a 17-year-old boy! This is how is used to do:* [audio message explaining how the Californian teenager defrauded thousands of Americans]. *According to you, a phishing attack succeeds more easily"* [1st option: *"by entering data"*]; [2nd option: *"opening an attachment"*]; [3rd option: *"by clicking on a link"*]*.*)

The quiz was designed as a way to test the player's knowledge of the web and the social media world. In between questions, concepts identified in the focus groups are clarified and explored in depth, treated with a colloquial register.

The transposition of the story into conversational language was developed in four main stages: the writing of the subject, the expansion of the narrative through plots and plot twists, the enrichment of the conversation with descriptive and detailed language, and finally the synthesis and transposition into conversational language.

The story has a nonlinear structure similar to game-books[16]: the players are given the opportunity to move within the narrative and they're stimulated to find the one ending that corresponds to what really happened to the protagonist. Alternative endings are only potential possibilities that serve to lead the player astray by generating doubt and stimulating critical reasoning.

2.2.5 Developing and Testing: Design Iteration and Scalability

NetWalking was developed on the *Telegram* platform to make the gaming experience very realistic and personal, allowing the user to immerse themselves in the game more easily and without the need to download any additional special app. The conversation is initiated simply by searching for the user "#walkerchallenge" in the search bar of the

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[16] The gamebook is a work of fiction that instead of being read linearly, from beginning to end, offers the reader the opportunity to actively participate in the story by deciding between a number of possible alternatives through the use of numbered paragraphs or pages.

instant messaging service. This makes it easier to establish a direct dialogue between the game's protagonist and the player in order to build trust and obtain the user's active involvement in the succession of the following challenges. In addition, the introduction decrees the user's choice to continue or quit right away. It makes the players familiar with the rules and defines the objectives, without tiring or boring them. Time restraints at this stage help keep the player's attention.

Cyclical comparisons between the professionals involved (designers, software developers, psychologists, and educationalists) and the students allowed for the development and testing of various prototypes until the final version of the game was reached. Testing was necessary to identify both areas where the story formed loops, i.e., combinations of choices that put the player in the position of repeatedly viewing the same story fragments. Simulating the time for the bot to type messages makes the interaction between the character and the player more realistic and prevents too many messages from being sent in bulk. The game experience replicates an ordinary chat conversation with a real person (Fig. 2). There are only two limitations for the player: the inability to ask direct questions to the protagonist and to keep the conversation open for more than 24 h.

Maintaining a modular design approach, to cope with the scalability and replicability of the prototyped solution, a toolkit was created aimed at teachers and freely downloadable on the official website of the project[17], which allows to prototype additional scenarios and expand the stories proposed within the game. The toolkit has the dual purpose of disseminating the project and exposing, through a methodological approach, the steps one must go through to design an educational game experience based on conversational design. The document has been divided into two parts: one in which the purpose of the project is recounted and the game is described in depth, and a second part in which the stages of designing a nonlinear story and a chatbot game are exposed.

3   Conclusions

The results of the experimentation, verified at the closure meetings held with the classes involved, showed how decisive the effects of the mix of open discussions, co-design activities, and the actual game experience were in the formation of critical thinking with respect to the use of new technologies and the Web. The experience of active participation in the intervention, over the two years of implementation, has shown a relevant impact compared to traditional interventions based on the logic of *inform to prevent*. The application of this methodology, as revealed by the feedback gathered at the group follow-up meetings, facilitated the development of the students' ability to dwell critically on issues affecting contemporary adolescence and their problem-solving skills.

Analysis of the qualitative data collected during the activities shows that the students who participated in the experimentation were able to expand their awareness of risks on the Web and their competence in recognizing those modes that are dangerous or dysfunctional. Through the application of Game Design and multimedia content creation mechanisms, the young participants also enhanced their media and digital literacy by becoming potential peer educators within similar interventions.

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[17] www.net-walking.it

The research shows that the application of Game Design principles can generate a positive impact both in the use phase of the output, the edugame, and in the design phase (co-creation, prototyping, testing, and iteration). Finally, the study demonstrates the pedagogical value of co-designing non-linear stories, in a logic of decision-based learning, as well as the level of empowerment in all dimensions of digital competence: technological, cognitive, and ethical.

4 Recommendations for Future Research

NetWalking did not require the use of AI, however, given the growing interest in the topic and the constant democratization of technologies, which allows for experimentation that is increasingly simple, intuitive, and accessible, a feasibility study is already underway to incorporate some AI features that can make the overall experience more engaging, immersive, and personalized. This would also give students the opportunity to learn the basics of NLP, as well as greater awareness of the AI potential, and its ethical dimensions.

The NetWalking application was developed by a team of professional developers on the Telegram platform. However, an updated mapping of open source tools available online showed that it might be possible in the future to have students develop the final product as well, through the use of software with simplified programming interfaces, which do not require the use and knowledge of specific programming languages. This would make the design and development process more straightforward and complete for students, without interruptions and handoffs during implementation. Finally, further development of the game will also involve the themes covered in the stories. The next developments may include the selection of diversified themes, also related to school learning subjects, to verify the adaptability of the system. The co-design model also lends itself to hybrid teaching environments and international exchange among young people from different backgrounds, as the language aspect would open up additional game and learning mechanics.

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From a Word-Formation
to a Concept-Formation: Mnemosphere
as a Connective Tool in Interdisciplinary Design

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Abstract. We are experiencing profound changes on a global scale and a different way of connecting with places, memory, and atmospheres. Adaptation is a necessary process.

In this context, the need to update languages is real and urgent [1]. There is a growing demand for new terminologies to disseminate ongoing changes and communicate them to professionals and the public. Neology is one of the main ways a language, and therefore a culture renews itself through a different narrative approach.

Design becomes the chosen field of experimentation and activation of new practices and theories that aim to bridge the gap between what we experience in the present reality and what, intangible, can only be captured by combining words.

It is within this framework or reference that the present paper illustrates the *Mnemosphere* project, interpreted through the lens of a new wor(l)d formation research. The project is based on the interdisciplinary design of a terminological combination.

Mnemosphere appears as a compound word that is still searching for a shared definition and a detailed characterisation but represents a potential theoretical and practical strategy that can be applied and developed in many ways.

This contribution focuses on the transition from a word-formation to a concept-formation recognising *Mnemosphere* neologism input as an active research tool to stimulate reflections, foster experiences, trigger design practices, and research actions in different contexts. After describing the theoretical framework, the paper will outline the main research activities to blur semantic boundaries within the new word actively.

Keywords: Neologism · Design Activator · Interdisciplinary Research · Memory · Emotion · Atmosphere

1 New Wor(l)d *Emergence*

Dealing with a new word has always been a delicate and complex process from a terminological standpoint. The lexical novelty still struggles to come up with a consensus definition that unites all the relevant fields of study. The term "new word" is used in

linguistics to refer to any newly created word, while the term "neologism" is reserved for unique terms that add to the language's lexicon [2]. Neology is one of the primary methods through which a language, and by extension, a culture, renews itself through a distinct narrative perspective. When neologisms are used, it is typically because new physical or conceptual phenomena are emerging or spreading, new scenarios are being developed, or old historical facts are being brought back to life by acquiring new semantic meanings.

Additionally, new terminology makes it possible to establish *connective identities* across many issues and fields, turning them into tools for promoting public participation. Neologisms might be "brand-new" terms that have never been thought of or spoken before, or they can be terminological compounds that derive meaning from the relationships between other words. According to Szymanek [3], there are two sorts of lexical formations, one of which is formed "*ex nihilo*" without any morphological alteration, while the other is a "derivational neologism," which is created from established and well-known lexical patterns and combinations. The formation of a neologism proceeds through a series of phases, resembling typical design processes, which can be simplified into three main categories: *invention*, *consolidation*, and *establishment* [4].

The first phase sees the word initially voiced and then written by a speaker. In this way, it materialises and begins to have semantic value. The new term typically does not appear following a particular design procedure. However, it sometimes happens for less planned reasons, such as to synthesise or to lessen grammatical complexity, when there are not enough words to convey a specific idea, or when it is necessary to mix concepts from other domains. The emergence of an *ad-hoc* formation, i.e. a previously non-existent combination of existing morphemes, is driven by various circumstances [Ibid., 73]. The second phase, known as 'consolidation', begins when a new formation gets ingrained in the language and spreads. This stage is when the *ad hoc* formation becomes a proper neologism that may potentially endure. The third phase seems to be the hardest to accomplish for the term. Institutions must acknowledge the innovative lexical item as an object that transcends the meaning of its terminological constituents by opening up a new horizon of meaning. A neologism must also be separated from nonce word-formations [5, 364] to elaborate even further. The former is consistent, and institutionalisation ensures their continued use in language; the latter are "one-off coinages" [6, vii] destined to join the common lexicon when first issued but quickly went out of fashion.

Despite the noticeable conceptual differences, the answer to a change appears to be the prevalent substrate for all neological variables. In most situations, the necessity for adaptability is what inspires neologism, i.e. the ability of language to adapt to change and provide lexical support for ongoing, physical, conceptual, and world changes. A new method of engaging with locations, memories, and the atmospheres created by their interaction is emerging due to the significant changes occurring worldwide. We are transitioning from an anthropocentric conceptual model to a *topophilic* attachment to space that is created and aims to engage in an emotional and empathetic discourse with the environment [7]. According to this paradigm, there is an actual and pressing need to upgrade languages.

The derivational neologisms, composed of pre-existing morphological material [8] and acceptable for mixing significantly different topics, appear to be the most appropriate terms. These words transform into instruments that may activate new design approaches and shift cultural frontiers by connecting concepts and disparate knowledge domains. In this regard, the *Mnemosphere project*, which is being presented here, will look into the fertile ground of a new word formation, which is obviously not yet defined in a univocal manner but which nonetheless develops into a connecting and polyphonic instrument on similar topics like the memory of places, the whole range of emotions, and the atmosphere of spaces.

The project investigates what it means to design for a neologism and what parameters, guidelines, and research actions may be triggered to define a *new unknown* through online and offline events.

2   New Word *Formation*

As soon as one tries to define a composite term in a clear-cut way, the instant understanding of the word seems to evaporate. When attempting to identify 'the distinctive air one breathes in a unique location', also known as the atmosphere, or 'the memories tied to a place that arises and blends into its fabric', also known as the places' memory, this process usually manifests. Without other conjuring pictures, it is challenging to understand how these affective and spatial elements create a personal emotional connection with the perceiver. However, the Mnemosphere project's goal is to start from this assumption to spark processes, activities, and research reflections to create a radical new concept in the design culture. Furthermore, it is tempting to claim that it is a pure neologism. This term has been used sporadically in literature[1], although a definition has never been formalised in any disciplinary field. Even in the design culture, it appears as a new word that offers itself to numerous experimentations. Mnemosphere project lives in this context and uses the new lexical item as a title and its definition as a principal objective. The research project Mnemosphere, currently under development, was prompted by the *MiniFARB Call for Ideas*, which has been supported by the Politecnico di Milano's Department of Design and involved PhD students and research fellows to provide funding and resources for *transversal* research projects. Because of the MiniFARB's emphasis on interdisciplinarity, the project is distinguished by a composite research team driven by the shared objective of producing different interpretations of the topics being addressed. Mnemosphere bases its approach on a synergic collaboration among distinct fields of knowledge (Fig. 1).

As stated before, the term "mnemosphere" is created by joining the words "MN+EMO+SPHERE," which in turn allude to the three themes that were examined: memory (MN), emotions (EMO), and atmosphere (SPHERE). The purpose is not to consider the extent of each thematic component but the actual relationship between them. In fact, the term "mnemosphere" was developed as a terminological reaction to the need

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[1] See: Goody, J. (1977). *The domestication of the savage mind*. Cambridge University, where the author refers to mnemosphere and memory based communication. See: Debray, R. (2000). *Transmitting Culture*. Columbia University Press, where the author refers to mnemosphere as the social period prior to the invention of writing.
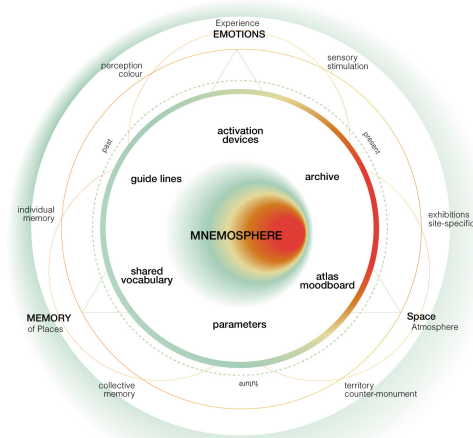
Fig. 1. Mnemosphere research conceptual map

for a single term, a conceptual entity, able to describe the effect of the interplay of the mnestic, atmospheric, and emotional domains.

In this setting, it is essential to emphasise that the themes addressed need to be investigated from a wide range of perspectives to be deemed a mnemospheric union. The concept of memory is viewed concerning the places where historical stratification of communal and individual narratives occurs. These locations are seen as intricate symbols of territorial interpretation [9], necessary for mnestic interaction, and an essential component of the surrounding environment. On the other hand, the atmosphere theme is closely related to the designed space. This research part adopts neo-phenomenological thinking [10], which has been spreading internationally in the humanistic and scientific academic community in recent years, as its primary theoretical reference for the aesthetic concept of "atmosphere" [11, 12]. Since people interact daily in engaging narrative and emotional experiences with the designed space (and thus not only natural) through different types of *displays*, the atmosphere of the space is explicitly studied in the field of exhibition-installation design.

Regarding the theme of emotions, the general designation refers to the sentimental aspect of experience and is defined by subjective as well as physiological and behavioural components. In this context, colour is one of the critical components in the design of the mnestic-spatial experience that may strongly influence people's perceptions and emotions, which in turn might influence their behaviour [13, 14, 3233]. Therefore, the research project suggests a method for studying emotions that emerges through the connection between colour, memory and space.

3   New Word *Stabilisation*

Mnemosphere was introduced in June 2020, while research and educational initiatives were being completely reevaluated in light of the COVID worldwide emergency. With a gradual redefining of the optimal tools and methodologies, the project moved all scheduled tasks from offline to online. This research was not affected by the obligations for a general rearrangement of methods; instead, it has presented a valuable chance to engage a larger audience and accesses broader cultural and geographical contexts. Research on the derived neologism has been discussed within the Design field. The Mnemosphere project has examined the connections between several themes that, via inherent overlap and mutual effect, enable the development of a collection of tools intended to enhance the territory through engagement using emotions and the designed space.

The experiment aimed to study the research subjects from both a theoretical and practical point of view, determining how the different areas contribute in a unique and cross-disciplinary way to the topic and examining neologism through fieldwork activities.

As a result, the study project was organised into the three methodological phases detailed below.

3.1   Exploration

In the first stage, each discipline field's current state of the art was examined to develop a unified theoretical framework. The innate intangibility of the numerous themes explored and the diversity of perspectives represented in the research served as its starting point.

The initial activity was directed at the semantic delimitation of the proposed concepts concerning the themes involved. Using an internal questionnaire with open and closed-ended responses, it was determined to adopt a shared vocabulary with a specific glossary of references as the main result. The *Mnemosphere lexicon*, an essential tool for this hermeneutic research, was collectively created by the interpretive synthesis of the replies and extrapolation of the keywords chosen by each team member.

The graphic identity of the research was also established during this point, highlighting the importance of being sensitive when visually integrating different topic sections and bringing back the universality of a single concept container. The logo was created from the sphere, which serves as the unifying element and alludes to the three-dimensionality of space. The circle serves as a dynamic representation of abstract concepts. Consequently, it was decided to employ nuances rather than rough shapes to accentuate the theoretical relationship between the concepts visually.

Due to the pandemic, it has become crucial to expanding the research to online communication platforms that would reduce geographic barriers and encourage a sense of closeness and engagement. This need led to the decision to create a social approach to publicly communicate the early results obtained, but more importantly, to reach a significant diversified audience. By configuring the graphical interface as a composite visual table of the mnemosphere lexical *nebula*, the connective vocation of the Instagram platform (*@mnemosphere.project*) serves as an evocative device and design tool to convey the research in its ongoing evolution. The theoretical undertones meant to

be transmitted to users are made more evident by a mood board type of approach and layout, encouraging both intimate and shared interaction.

3.2 Analysis

The research's intermediate phase attempted to gather information through several planned online activities highlighting the images' visual aspects.

The lexical and literary apparatus had a crucial role in organising the subjects' complexity. However, they did not appear to accomplish enough to define adequately, express, and convey the perceptive aspect of the "mnemosphere". In order to represent the neological value built into the images created by a visual-formal composition, *content visualisations* also seemed to be essential. For these reasons, an *Open Call for Images* was published online to translate a method generally used in the visual arts sphere to the design domain, thereby encouraging *creative cross-fertilisation*, i.e. hybridisation, among different disciplines, fields and creative ways of expression.

A brief survey and a participant's choice of up to three images were required for the open call. General inquiries concerning the participants' identity were asked in the first section, as well as open and closed questions concerning the new concept of the Mnemosphere on what kind of imagery came to mind associated with this term. In contrast, the second section was solely devoted to image uploading. Each participant was invited to upload a maximum of three files with a title and a description, with no limitations on format, communication style, or figurative language. Photographs, illustrations, paintings, collages, drawings, and sketches were among the many different types of media employed by the participants, which collectively brought heterogeneity and expressive variation to the Mnemosphere theme.

3.3 Synthesis

The last stage involved synthesising all the data to establish parameters and repeated factors among the images and descriptions.

More than 200 contributors worldwide participated in the Open Call, which lasted from the middle of January to the end of March 2021. They uploaded more than 400 diverse images that captured the subjective essence of mnemospheric perception. The research project's official platform, the website (https://www.mnemosphere.polimi.it/), has been updated with all of the gathered contributions (authors, pictures, titles, and descriptions) as a digital database and public online exhibition[2].

The research group made a set of Identity Cards as a preliminary step in examining all the contributions. These tools provided a more thorough, synthetic, and visually understandable summary of the data present in each contribution, enabling the pictures to be arranged for analytical examination.

Each card provided:

- several interpretations for textual information (containing concepts and descriptions),

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[2] This online resource was designed to share with all participants the results obtained but also as a repository of images and knowledge for further research by other researchers and scholars in other fields.

- visual information (consisting of percentages of colours and themes involved)
- sensory information (relating to the senses involved in the narrative of each image).

In order to categorise and organise all of the submitted submissions, internal online and offline workshops were organised using various methodologies based on the disciplinary standpoint addressed. The workshop activities proved valuable methods to extract transversal key concepts that could be translated into parameters for designing mnestic spaces and atmospheres.

The first workshop concentrated on image processing from an atmospheric-spatial perspective. All the images were divided into seven categories that permitted the discovery of shared morphological features, representational modalities, unique framings, and repeating subjects. The strategy was solely visual and less dependent on language descriptions of the images.

The categories include:

- "Atmosphere as Air" in which wide spaces, sky, and horizons appear;
- "Atmosphere as Bubble", where circularity and the nest emerge;
- "Atmosphere as Fog" where undefined areas, in motion and out of focus, arise;
- "Atmosphere as Diaphragm" where components linking interior and external, such as entrances, hallways, doors, and windows, show up;
- "Atmosphere as Net", in which complex, interconnected spaces and conceptual and practical connective elements emerge;
- "Atmosphere as Colorful", where images with colour, tone, and abstract symbolism as the main characters spring up;
- "Atmosphere as Void," where singularities, empty spaces, and places full of nothingness and melancholy appear.

The second workshop was arranged from a mnestic standpoint, but it took a different approach, emphasising the interpretation of texts and descriptions rather than the analysis of the visual material. In this context, the images were divided into four conceptual categories:

- "individual memory", where faces of people, details of bodies and private spaces frequently emerge;
- "collective memory", where the forms of externalisation of memory predominate, especially monuments and memorials;
- "physical environment" where natural environments like landscapes and urban and domestic environments arise;
- "abstract dimension" is characterised by symbols, vibrant pictures and free signs, forms, and colours.

Following the creation of the visual compositions, now referred to as "atlases", it was feasible to examine the colour components of each central theme and create an investigation of the emotion theme from a chromatic point of view. The analysis was supported by 25-colour charts created for each visual atlas allowed for detecting harmonic and opposing relationships and the conceptual link within semantic clusters. These charts allowed for identifying similarities and divergences in the thematic atlases. In this way, it was feasible to state that the hues of the natural world and the materials of certain places

had an impact on the memories associated with them on an individual and a collective level, and as a result, the emotional "temperature" experienced by the perceiver/open call participant. Gradually integrating the location into the user's emotional experience changes the colours, brightness, and saturation of the realistic depiction of the location and environment.

3.4 Results

The visual research of Aby Warburg, one of the most renowned contemporary art historians, serves as the inspiration for the historical backdrop for analysing the open-call pictures. Pioneer of the interdisciplinary study of culture across history, Warburg emphasised the need for scholars to quit enforcing disciplinary boundaries to understand better how *cultural memory* works [15]. His panel system, embodied in his most significant work, *Atlas of Mnemosyne* (1924-28), inspired the methodological approach of the Mnemosphere atlases. The images in the panels were assembled and arranged in groups or sequences, which made it possible to perceive an underlying harmony at first glance; visual components were not placed in a hierarchical relationship to each other, and their positioning was not fixed, but fluid and could therefore continually change according to the investigation evolution [16].

These assemblages made it possible to link different works of art produced by artists in different periods and geographical contexts, which converged in large iconographic tables having a solid aesthetic and artistic installation *aura* effect. Atlas images are the prime subject of study because they provide a transversal and striking way of narrating world cultures, histories and aesthetics. In *Mnemosyne Atlas*, the juxtaposition of images, which weave different elements around a central theme, creates different fields of energy that trigger an open and dynamic interpretative process in the perceiver.

The mnemospheric exploration, sparked by the participatory open call and the workshops and subsequently took shape through the digital atlases, seeks to provide several visual *hypertexts* [17]. In order to gain new meanings that might capture the mood and recollections of the places, the images lose some of their original meaning. The loss of sense of some images is not a negative and uncontrolled aspect but an engine of development for a shared and participating definition of the Mnemosphere. The *Mnemosphere Atlas* (Fig. 2), which takes its cue from Warburg, is a dynamic tool for a neological study that may materialise the mnemonic imagination and provide unique interpretive processes in design.

4 New Wor(l)d *Embodiment*

The project's objective was to present the new word Mnemosphere as a research activator in the design culture by explaining its primary operations. Thanks to its participatory visualisation through Open Call, it has become a neologism open to many knowledge domains: it can spark reflections in several disciplinary areas, including art, photography, and architecture. Mnemosphere now emerges as a term transitioning from word-formation to an effective concept-formation, even though a strong establishment and institutionalisation process has not yet been fully accomplished. The term reveals

Fig. 2. Extract from the Mnemosphere atlas panels

itself as an autonomous entity, transcending its conceptual components to display their composite junction, and the meaning appears to be considerably less *hazy*.

Mnemosphere neologism comes across as a notion that lives and communicates its complexity through aggregation, capable of generating deep involvement.

It is nevertheless clear that further experiments and applications are required, notably in the form of exhibition spaces and installations that may explore the multicomponent character of the mnemospheric dimension, considering the terminological and design development that has been realised through the atlases.

In this sense, the research intends to proceed by extending to more different offline activities, including active and proactive participation.

Plans include:

- To hold a series of Mnemosphere seminars with academics and professionals to broaden the project's impact.
- To participate as curator of a group show in Lisbon with *GAAT Museum - Garagem, Arte, Arquitectura, Tecnologia*, to transform the concept of Mnemosphere into the exhibition of original artistic experiments united by a shared vision.
- To publish the Mnemosphere research and atlas with all the guidelines and findings, thus making the neologism in the design culture more effective.

Above all, the aspiration is that this experience will not remain enclosed in a terminological definition made up of images, words, and concepts but may be the starting point for further reflections, practices and studies.

In conclusion, this contribution sought to propose an alternative and new approach to knowledge, starting with a neologism coined by interdisciplinary research that has enabled diverse creative research processes, thus contributing to design culture and expanding its theoretical and design boundaries.

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