# Quaderni di Comunità

## Persone, Educazione e Welfare nella società 5.0

## Community Notebook

People, Education, and Welfare
in society 5.0

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TEACHING ENHANCED LEARNING FOR ENGAGING AND INCLUSIVE LEARNING

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# INDICE

# 3. DESIGNING MICROLEARNING PROGRAMMES FOR CENTENNIALS' TASTES[1]

by Maria Fabiani[*], Patrizio Pastore[**]

**Abstract**: *The present study is the initial phase of a larger project on the design of microlearning programmes in two Italian universities. The cross-sectional study investigates differences in perceived digital skills and positive orientation towards the use of learning technologies in two generations (Millennials and Centennials), explores generational differences in terms of cognitive component of hedonic well-being, career adaptability, self-compassion, perceived social support, and sensory processing sensitivity.*

**Key words**: microlearning; generation z; digital empathy; digital safety; digital skills; sensoring processing sensitivity

## *Introduction*

Due to the rapid development of new technologies and current social and educational changes, the educational process is changing, and students require new teaching methods and approaches to acquire new knowledge and skills. The use of microlearning to complement traditional learning methods is a

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potential solution to this necessary shift in the educational process that can enhance the learning experience for Gen Z students.

In recent years, microlearning has been increasingly integrated into the educational process. Content "chunking" is an online pedagogical approach based on cognitive information processing (CIP) research, which states that information must be broken down into small, manageable "chunks" to reduce cognitive load and improve learning (Mayer 2005). However, for this method to be effective, it must allow everyone to build on their knowledge by showing them the best way to achieve the proposed goal. Student-centred learning is based on constructivist learning theory and supports student learning by allowing students to make decisions in their learning (Goodman *et al.*, 2018).

Research has shown that an individual's adaptability is important in predicting academic success (Holliman *et al.*, 2019; Holliman *et al.*, 2020). And career adaptability can be seen as one of the psychosocial constructs that is useful for successfully coping with unexpected challenges and both professional and academic transitions (Savickas, 2005, 2012). In the university context, social support is also associated with academic performance, persistence, and psychological wellbeing (Holliman *et al.*, 2021). However, research on their relationship with digital technology use and propensity is still limited.

Moreover, there is a growing recognition of the need to promote theories, research and practices that address the impact of pressing social and personal development challenges in the development of training, guidance and education pathways and programmes (Blustein, 2011; Guichard, 2013). In the context of educational design, self-development and reflexivity are central processes. Positive Youth Development (PYD) emphasises the importance of building individual resources and strengths, not only as protective factors to address challenges, but also as resources

that enable young people to fully develop and contribute meaningfully to society (Catalano *et al.*, 2004; Lerner *et al.*, 2021; Kozan *et al.*, 2014; Shek *et al.*, 2019).

Personality-related predispositions cause people to approach everyday situations differently, and the idea that individual differences, including personality traits, can significantly influence the behaviour of Internet and digital tool users is not new. In fact, personality traits have long been known to act as antecedents of cognitive attitudes and behaviours and subsequent technology use (Agarwal & Prasad, 1999; Harrison & Rainer Jr., 1992). Several studies have examined the relationships between personality traits, as measured by the Big Five Factor model, and the acceptance and use of digital tools and the internet (recently, Akbari *et al.*, 2023; Chew, 2022; Liu & Campbell, 2017). However, there is a dearth of literature on the impact of the temperamental trait of sensory processing sensitivity on digital tool adoption and usage patterns. Sensory processing sensitivity (SPS) is a common (estimated to affect 15-20% of the population), heritable and evolutionarily conserved trait that describes inter-individual differences in sensitivity to both negative and positive environments (Greven *et al.*, 2019). This temperamental trait is characterised by increased central nervous system sensitivity and deeper cognitive processing of physical, social and emotional stimuli. The concept of high sensitivity does not overlap with hypersensitivity, which reflects an individual's emotional capacity following trauma. Only two studies have examined the relationship between this temperamental trait and digital use: Ershova *et al* (2020) investigated the relationship between sensory processing sensitivity and internet addiction, and Nowakowski (2021) assessed differences in the perception of web content by highly sensitive people.

To fill the gap, the present work examines the generational differences in perceived usability and positive orientation towards

the use of learning technologies, exploring generational differences in the cognitive component of hedonic well-being, career adaptability, self-compassion and perceived social support from family, friends and significant others, and sensory processing sensitivity.

## *1. Literature review*

The need to integrate technology in education and the use of educational technology in the teaching-learning process is a widely accepted idea in the field of educational sciences. Many studies show that the integration of technology in education and its use in the teaching-learning process increases students' academic success and motivation, positively affects their attitudes towards learning, supports the development of problem-solving and cooperative learning skills, and provides teachers with more time to teach their students (Yalçın-İncik & İncik, 2022). Furthermore, the importance of online technology is particularly emphasised in new learning and teaching methods. This is especially important for Generation Z, who derive their knowledge from the Internet and focus on quickly searching for information.

### *1.1 Microlearning and micro-credential, a European approach*

Recently, micro credentials have gained attention in policy debates across the European Union. In its "Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030)", the European Council (2021) calls for reinforcing the key role of higher education systems in supporting lifelong learning and reaching a more diverse student population by proposing the use of

micro-credentials to help widen learning opportunities and strengthen the role of universities in lifelong learning by providing more flexible and modular learning opportunities and more inclusive learning pathways. On 16 June 2022, the Council of the European Union adopted a Recommendation on a European approach to micro-credentials for lifelong learning and employability, alongside another proposal on individual learning accounts. The Recommendation aims to support the development, implementation and recognition of micro-credentials across institutions, enterprises, sectors and borders. In the same year, a document was published by a group of European experts (Microbolol, 2022), which aims to provide a common framework for micro-credentials and guidelines for the practical transfer of micro-credentials into education and training contexts. The Recommendation (Council of Europe, 2022) includes a description, standard elements for characterising micro-credentials, and concepts for constructing and issuing micro-credentials as building blocks. As a result, micro-credentials can be created, used, and compared in a consistent way across sectors, fields and borders by Member States, stakeholders, and different providers (from education and training institutions to private companies). This will enable people to acquire new skills in a personalised and comprehensive way. The Recommendation promotes the creation and use of high-quality, transparent micro-credentials and identifies key areas for action in education, training, and labour market policies.

The European approach to micro-credentials is a key component of the Commission's vision of a European Education Area by 2025 (European Commission 2020; 2022) and micro credentials also features in the European Pillar of Social Rights Action Plan (European Parliament, Council and Commission, 2017). Nevertheless, most countries do not yet have an official definition of

micro credential or microlearning. Even the term micro credentials is not well known, with certificates for short learning formats being referred to in different ways, including micro certificates, badges, micro/partial/additional qualifications or module certificates (Cedefop, 2022).

Micro-credentials are seen by higher education institutions as a way of innovating their pedagogical practices (European Commission, 2021; Varadarajan *et al.*, 2023). Learners can acquire new skills in a more student-centred way and benefit from the openness and transparency of participatory learning practices and peer learning communities (Varadarajan *et al.*, 2023; Cedefop, 2022). In addition, micro-credentials provide a new avenue for universities to rethink their strategies and policies for delivering traditional courses, which are typically more expensive and of longer duration (Varadarajan *et al.*, 2023). This is because micro-credentials are based on a human capital perspective, in which individuals invest in themselves to second-guess the demands of the labour market (Tamoliune *et al.*, 2023). Furthermore, micro-credentials are not only about financial rewards, but also about improving the quality of an individual's social life (Cedefop, 2022; European Commission, 2021; Tamoliune *et al.*, 2023). This is also supported by the fact that research has shown that increased investment in education leads to increased economic output (Tamoliune *et al.*, 2023). According to the OECD (2021a; 2021b), learners who participate in micro-credential programmes offered by higher education institutions are better educated, more skilled and have higher levels of financial and social support from employers. However, the evidence in the literature is mixed. A review by Moodie and Wheelahan (2022) criticises micro-credentials and concludes that, based on the limited evidence available, they have weak employment outcomes, at least in the US labour market.

Micro-credentials can help to broaden the range of learning and skills development opportunities and enable higher education institutions to remain responsive to the needs of industry as well as providing education to the masses (Tamoliune *et al.*, 2023). Moreover, a sustainable European approach to micro-credentials should encompass the public mission of universities to provide high quality and innovative education and training (Tamoliune *et al.*, 2023). International literature suggests that lifelong learning should be implemented in partnership and systematically across government, beyond the responsibility of education departments, with strong coordination required to support learners (e.g., OECD, 2021a; 2021b; Cedefop, 2022). Nevertheless, the assessment and recognition of micro-credentials is largely limited to employers and policy makers, which means that more discussion is needed to provide a more coherent approach and understanding of the potential of micro-credentials (Tamoliune *et al.*, 2023).

The concept of micro credentialing is linked to that of microlearning. Although there are numerous concepts and versions of microlearning (Hug, 2005), according to Buchem and Hamelmann (2010) the common qualities of microlearning include microcontent, a focus on a single specified idea or topic, and a short learning time (i.e., no more than 15 minutes). For the purposes of this paper, we define microlearning as an instructional strategy in which learning content is broken down into small, focused activities and delivered digitally in an easily digestible, results-oriented form (Emerson & Berge, 2018; De Gagne *et al.*, 2019; Grevtseva *et al.*, 2017; Nikou & Economides, 2018). In line with Sankaranarayanan *et al.* (2023), we consider microlearning to be a learning format that leverages the use of technology (e.g., mobile devices) rather than a technology-dependent learning format.

Microlearning is a new educational paradigm that offers potential benefits to both educators and students. It is often

associated with e-learning, mobile learning and informal learning activities and can help to address the challenges of information overload and short-term focus in higher education (De Gagne *et al.*, 2019). Microlearning can be used to improve student engagement and knowledge retention in higher education by combining face-to-face learning with activities outside the classroom and by reducing the cognitive load on working memory (De Gagne *et al.*, 2019; Giurgiu, 2017; Shail, 2019). It can also improve students' self-regulation, engagement, and motivation (De Gagne *et al.*, 2019; Nikou, 2019; Liao and Zhu, 2012). Microlearning can be an effective teaching-learning process in online and hybrid learning environments (De Gagne *et al.*, 2019). It can help to improve students' knowledge and confidence in performing procedures, studying, and engaging in collaborative learning (Fidan, 2023).

Microlearning can also reduce the amount of information and make learning more attractive to students (De Gagne *et al.*, 2019). The role of the prosumer and interaction in the classroom, combined with Web 2.0 and mobile technology, can provide more meaningful outcomes for students (Fidan, 2023). In addition, microlearning content facilitates learning with visual chunks, and provides opportunities for learners and teachers to increase engagement and presence in online learning (De Gagne *et al.*, 2019) and engagement in collaborative learning (Reinhardt and Elwood, 2019; Zhang and Ren, 2011). Other key benefits of using microlearning include improving learners' motivation (Nikou and Economdies, 2018; Halbach and Solheim, 2018; Shail, 2019), and improving learning ability and performance (Mohammed & Nawroly, 2018; Jomah *et al.*, 2016).

Disadvantages of microlearning may include pedagogical discomfort, technological inequalities, and privacy concerns (Fidan, 2023).

## *1.2 Generation Z*

Generation Z, also known as Centennials, is often referred to as the iGeneration (iGen) because of their natural childhood use of the internet, digital technologies (especially touch), and social media and networks, which are an important part of their socialisation and maturation.

Born between 1996 and 2010, Centennials are the first generation to have grown up with the internet and social media, but this does not necessarily mean that they have the digital skills to manage their education efficiently and effectively. There is a significant difference between what young people do with digital technologies and what they know about these digital technologies. For example, they have been found to have a low awareness of information security and their ability to cope with changes in digital technologies may be insufficient (Hernández-Martín, Martín-del-Pozo, Iglesias-Rodríguez, 2021), especially if they feel socially isolated/anxious (Lyngdoh, El-Manstrly, Jeesha, 2023).

It is also the generation that has grown up in a world characterised by political polarisation, racial unrest, the Covid-19 pandemic and the climate crisis (Deloitte Global, 2021). All this turmoil and uncertainty has had an impact on their mental health. According to the latest available ISTAT data (2018; 2021), suicide accounts for almost 12% of deaths between the ages of 20 and 34 in Italy, and there are around 220,000 14–19-year-olds who are dissatisfied with their lives and, at the same time, have poor psychological well-being. It is not easy to study the causes that undermine mental health because disorders are different and linked to personal characteristics and experiences, genetic and environmental factors, which need to be analysed and assessed individually. However, as the phenomenon has taken on a structural character, it has become important to include in the

analyses factors that can negatively or positively affect mental health.

### *1.3 Temperamental trait, social support, adaptability, and self-compassion*

Research on university adjustment has focused on the effects of individual characteristics such as temperament, adaptation, and perceived social support (e.g., Cobo-Rendón, 2020; Indani & Pratiwi, 2021; Erzen & Ozabaci, 2023). In general, the factors that can affect the college adjustment can be viewed from a personal and environmental perspective. Temperament is a biologically based individual difference that influences how people respond to their environment. Adaptability is the ability to adapt to new situations and environments and is related to how individuals cope with the demands of university life. Perceived social support is an important factor in the development of successful university adjustment, as it provides individuals with a sense of belonging, love and acceptance. Previous studies have found that perceived social support is a protective factor in challenging situations imposed by the university (Cobo-Rendón, 2020; Erzen & Ozabaci, 2023). According to the findings of Dvoáková, Greenberg, and Roeser (2019), self-compassion can be a coping process and the practice of self-regulation strategies in university transitions. Young people felt more programmes were needed to teach self-compassion, and these should be tailored to individual preferences in delivery (e.g., group, individual, online) and be inclusive of diversity in gender, culture, sexuality, and individual experiences. Self-compassion interventions have been shown to help young people with anxiety and depression. A recent review (Egan *et al.*, 2022) reported that consultation with young people suggested that they would be interested in self-compassion interventions, but that the interventions should be

delivered in a range of formats and adapted for diversity. Both self-compassion specialists and young people highlighted the need to reduce self-criticism as a factor in the effectiveness of self-compassion interventions.

## *2. Objectives of the cross-sectional study*

The study aimed to investigate generational differences in perceived usability and positive orientation towards the use of learning technologies, and to examine generational differences in the cognitive component of hedonic well-being, career adaptability, self-compassion and perceived social support from family, friends, and significant others.

Given the temperamental specificities of sensory processing sensitivity, we intend to explore the correlations between the two dimensions of digital security and digital empathy with sensory processing sensitivity and its three dimensions, Ease of Arousal - EOE, Aesthetic Sensitivity - AES and Low Sensory Threshold - LST. It is assumed that AES promotes proactive behaviour due to its relationship with the increased sensitivity of the Behavioural Activation System - BAS (Gray, 1991), which indicates high motivation and the impulse to engage in proactive behaviour.

## *3. Materials and methods*

### *3.1 Study design and population*

A cross-sectional analytical study was conducted, based on an online, anonymous, self-administered survey.

Convenience sampling was used to recruit undergraduate nursing and speech therapy students from the University of Tor Vergata in Rome and primary education students from the University of Molise. Participants gave their consent to take part in the study.

To be included in the sample, students had to be enrolled in the first three years of their studies and give consent to participate in the study.

### *3.2 Procedure*

Participants were enrolled with a survey developed and administered using the EU Survey platform, supported by the European Commission's ISA² programme. The survey was available in the last quarter of 2022. The link to the questionnaire was sent to the students by the university staff via institutional emails and social networks (including Instagram and WhatsApp).

### *3.3 Measures*

The questionnaire was structured by a section dedicated to the collection of socio-demographic information (year of birth, field of study and year of enrolment, social and digital content preferences, perceived ability to use different digital tools) and a battery of tests.

The classification of generations adopted was as follows:

- Centennials or Generation Z: born between 1996 and 2010;
- Millennials or Generation Y: born between 1981 and 1995;
- Generation X: born between 1965 and 1980.

The DigiSkill (Fan & Wang, 2022) in its Italian version (Fabiani, 2023) was used to assess perceived user skills. The

DigiSkill is a scale composed of 27 items on a 7-point Likert scale, from 1 = lowest to 7 = highest, organised into six factors reflecting five dimensions of digital literacy: information (two factors: access and management of digital content and use of digital media); communication (factor: communication of digital content); creation (factor: creation of digital content); digital security (homonymous factor); digital empathy (homonymous factor). In this study, the scale showed good reliability with a Cronbach's alpha of 0.85 for information – access and management of digital content, a Cronbach's alpha of 0.88 for information – use of digital media, a Cronbach's alpha of 0.90 for the dimension communication of digital content, a Cronbach's alpha of 0.91 for the dimension creation of digital content, a Cronbach's alpha of 0.84 for the dimension digital security, a Cronbach's alpha of 0.85 for the dimension digital empathy. The Digital Security and Digital Empathy competencies have been proposed as two independent dimensions in this study. As digital environments become increasingly complex and more people misuse or abuse information, digital security and digital empathy skills are important factors for young people as they help them to understand online risks, avoid being harmed and achieve positive outcomes from using digital tools.

The Satisfaction with Life Scale (SWLS, Diener *et al.*, 1985) was used to assess the cognitive component of hedonic well-being. The scale consists of five items (e.g., "I am satisfied with my life", "My living conditions are excellent") on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The scale has a unidimensional factorial structure. The Cronbach's alpha coefficient in the original study is 0.88. In addition to its excellent psychometric properties, this scale has the advantage of brevity, which makes it easy to include in very large test batteries.

Career adaptability was measured by Career Adapt-Abilities Scale (CAAS; Porfeli & Savickas, 2012), developed to measure specific attitudes, beliefs, and competencies of career construction in four subscales, namely, concern (e.g., "Thinking about what my future might be"), control (e.g., "Making decisions about myself"), curiosity (e.g., "Exploring my surroundings"), and confidence (e.g., "Performing tasks efficiently"). Each subscale was comprised of six 5-point Likert-type scale items ranging from 1= not strong to 5 = strongest. Items were summed to create a score ranging between 5 and 30 for each subscale, with higher scores referring to higher levels of career adaptability.

The Multidimensional Scale of Perceived Social Support (MSPSS, Zimet *et al.*, 1988) was used to measure social support as a multidimensional construct. The MSPSS consists of 12-items that measures social support from three domains: family (e.g., "My family goes out of their way to help me"), friends (e.g., "I can talk about my problems with my friends"), and a significant other. Respondents can express their level of agreement on a 7-point Likert scale (from 1 = strongly disagree to 7 = strongly agree). In the present study, only the total score was used. An additional advantage is that the 12-item MSPSS is quick and easy to administer and has good psychometric properties in terms of dimensionality, reliability, and validity.

The Self-Compassion Scale (Neff, 2003) includes 26 items answered on a 5-point Likert scale (1 = almost never to 5 = almost always). Six compassions dimensions are assessed: self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification. The total SCS scale with a Cronbach alpha coefficient of 0.82 was used in the present study.

The Highly Sensitive Person Scale - Brief Version (HSP-12) is a 12-item self-report measure designed to assess environmental sensitivity in adults. The instrument was created by selecting items

from the original Highly Sensitive Person (HSP) scale, a 27-item scale (Aron & Aron, 1997). The items included in the HSP-12 are those that loaded strongly on the bifactor structure found in previous studies (i.e, Pluess, *et al.*, 2020). Each of the 12 items comprising the instrument is rated on a 7-point Likert scale. Based on the mean score obtained, individuals can be classified into one of three groups along the sensitivity continuum: low, medium, and high sensitivity. It is important to note that the HSP-12 is not a diagnostic tool. The HSP-12 was found to have good internal consistency, with a Cronbach's alpha of 0.78 in the original study.

## *4. Results and discussion*

The results are presented and discussed in the light of evidence from the literature.

### *4.1 The sample*

The sample consisted of 284 subjects, of whom 4.2% belonged to Generation X, 17.6% to Generation Y and 77.8% to Generation Z (Table 1).

*Table 1: Distribution of the sample by generation: Generation X; Generation Y (Millennials); Generation Z (Centennials). Absolute values and percentages*

| | | Frequency | Percentage | Valid percentage | Cumulative percentage |
|---|---|---|---|---|---|
| Valid | | 1 | 0.4 | 0.4 | 0.4 |
| | X | 12 | 4.2 | 4.2 | 4,6 |
| | Y | 50 | 17.6 | 17.6 | 22.2 |
| | Z | 221 | 77.8 | 77.8 | 100.0 |
| | Total | 284 | 100.0 | 100.0 | |

The sample is predominantly female, with only 8% of respondents being male. The average and median ages recorded for each generation are shown in Table 2; the average is around 45 for Generation X, 34 for Millennials and 22 for Centennials (Table 2).

*Table 2: Sample age: descriptive statistics*

| Generation | N | Median | Mean | Std. deviation |
|---|---|---|---|---|
| X | 12 | 44.50 | 45.17 | 2.082 |
| Y | 50 | 33.00 | 34.18 | 4.313 |
| Z | 221 | 21.00 | 21.87 | 1.658 |
| Total | 283 | 22.00 | 25.04 | 6.742 |

The distribution of the sample by level of education shows that 85% of the cases have upper secondary education (ISCED 3), 8.5% have master's degree (ISCED 7) and 6% have a bachelor's degree (Table 3).

*Table 3: Frequencies by level of education. Absolute values*

| | Frequency | Percentage | Valid percentage | Cumulative percentage |
|---|---|---|---|---|
| Second level academic degree/master's degree (ISCED 7) | 24 | 8.5 | 8.5 | 8.5 |
| Post-secondary non-university education (ISCED 4) | 1 | 0.4 | 0.4 | 8.8 |
| Upper secondary education (ISCED 3) | 241 | 84.9 | 84.9 | 93.7 |
| Short-cycle tertiary education (ISCED 5) | 1 | 0.4 | 0.4 | 94.0 |
| Bachelor's degree or equivalent (academic degree/degree) (ISCED 6) | 17 | 6.0 | 6.0 | 100.0 |
| Total | 284 | 100.0 | 100.0 | |

Most of the participants are therefore first-time students at a university.

*4.2 Orientation to the use of technology in life and learning in Millennials and Centennials*

Positive attitudes towards the use of technology in student learning were measured using a dichotomous variable (0=no/1=yes) from the response to the question "In your opinion, can technologically innovative teaching improve student attention, motivation and learning?" More than 90% of the participants answered in the affirmative. Only 9.5% of respondents answered in the negative. When broken down by generation (Table 4), the ratings show similar percentages of responses (10.5% 'no' for Generation Z, 8.7% 'no' for Generation Y).

*Table 4. In your opinion, can technologically innovative teaching improve students' attention, motivation, and learning? Response frequencies per generation*

| | | In your opinion, can technologically innovative teaching improve students' attention, motivation and learning? | | |
|---|---|---|---|---|
| | | no | yes | Total |
| Generation | | 1 | 0 | 1 |
| | X | 1 | 11 | 12 |
| | Y | 4 | 46 | 50 |
| | Z | 21 | 200 | 221 |
| Total | | 27 | 257 | 284 |

Table 5 shows a summary of the responses by generation to the question about the number of socials that respondents said were important. For a third of respondents, the number of socials cited as important is five. It is interesting to note that 41.7% of

Generation X respondents cite five socials as important, while this figure drops to 32% for Centennials.

*Table 5: Contingency table Generation* Number of socials cited as important. % in Generation*

| | | Number of cited socials | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
| Generation | | | 100.0% | | | | | | 100.0% |
| | X | | 25.0% | 8.3% | 25.0% | 41.7% | | | 100.0% |
| | Y | | 8.0% | 26.0% | 26.0% | 38.0% | 2.0% | | 100.0% |
| | Z | 0.9% | 8.6% | 27.6% | 29.0% | 32.1% | 0.9% | 0.9% | 100.0% |
| Total | | 0.7% | 9.5% | 26.4% | 28.2% | 33.5% | 1.1% | 0.7% | 100.0% |

Comparing the social media usage statistics of millennials and Gen Z provides interesting insights into the digital behaviour of the two generations. Gen Z prefers emerging sites such as TikTok and Instagram to Facebook, which is more popular among Millennials. WhatsApp is valued by both Millennials and members of Generation Z (Figure 1). Overall, these findings suggest that the differences between Millennials and Gen Z go beyond age. When it comes to social media, each generation has its own set of interests and priorities.

*Figure 1: Radar chart of social media preferences*

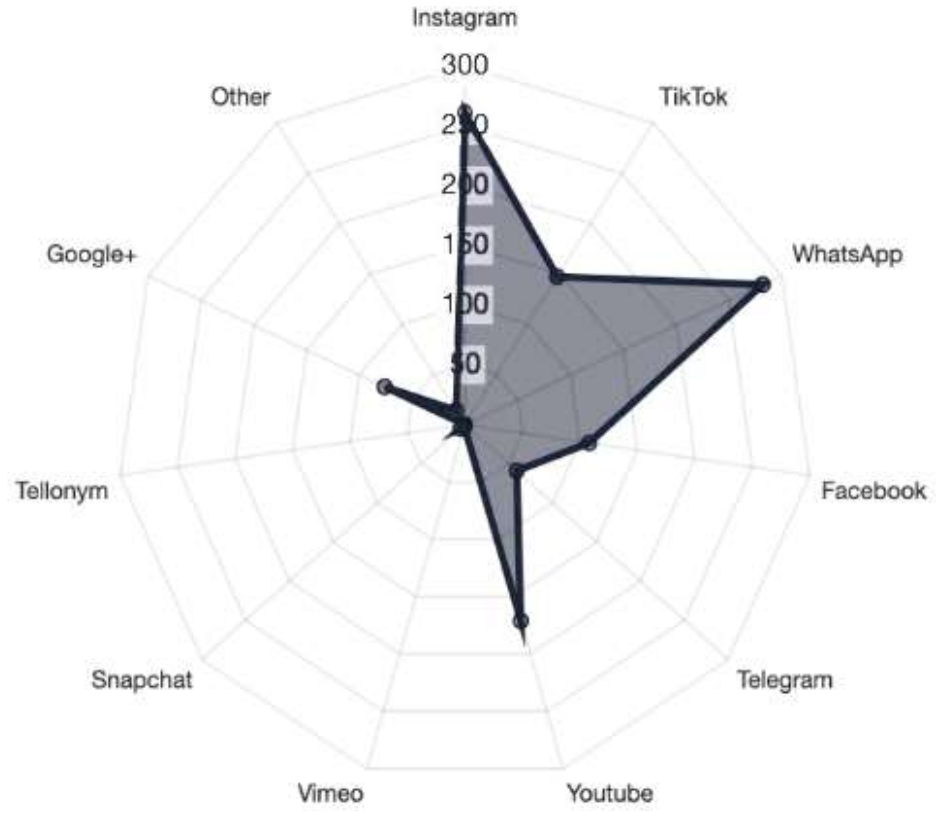



Table 6 shows the first differences between Millennials (Y) and Centellians (Z) in their self-assessment of their ability to use different digital tools. Significant differences, detected by means of the t-test for the difference of means in independent samples, exist only in the use of computers, Word or pages, Excel or numbers, where it is the Millennials who, on average, consider themselves to be more proficient (p-value <0.05). Generation Z perceives itself as more competent in the use of social media, and for Instagram, TikTok and WhatsApp: the mean scores are significantly in favour of the Centennials. The differences in the other items are not statistically significant.

*Table 6: Perceived digital capabilities. Difference in generation averages between Centellians and Millennials*

| Please give a grade from 1 (lowest) to 5 (highest) for: | Generation | N | Mean | Std. deviation | **p-value T-test** |
|---|---|---|---|---|---|
| ability to use the smartphone | Y | 50 | 4.44 | 0.812 | |
| | Z | 221 | 4.51 | 0.637 | 0.499 |
| computer skills | Y | 50 | 4.08 | 0.877 | |
| | Z | 221 | 3.75 | 0.831 | **0.017** |
| ability to use word or pages | Y | 50 | 4.16 | 0.976 | |
| | Z | 221 | 3.78 | 0.898 | **0.015** |
| ability to use excel or numbers | Y | 50 | 3.32 | 0.913 | |
| | Z | 221 | 2.74 | 1.075 | **0.001** |
| ability to use power point or keynote | Y | 50 | 3.50 | 1.074 | |
| | Z | 221 | 3.58 | 1.044 | 0.611 |
| ability to use Prezi | Y | 50 | 1.72 | 0.948 | |
| | Z | 221 | 1.77 | 1.086 | 0.767 |
| ability to use Instagram | Y | 50 | 3.76 | 1.333 | |
| | Z | 221 | 4.57 | 0.714 | **0.000** |
| ability to use Tik Tok | Y | 50 | 2.12 | 1.288 | |
| | Z | 221 | 3.70 | 1.284 | **0.000** |
| ability to use Facebook | Y | 50 | 4.14 | 1.278 | |
| | Z | 221 | 3.88 | 1.234 | 0.186 |
| ability to use Twitter | Y | 50 | 2.26 | 1.440 | |
| | Z | 221 | 2.20 | 1.306 | 0.770 |
| ability to use Telegram | Y | 50 | 2.94 | 1.476 | |
| | Z | 221 | 3.15 | 1.440 | 0.356 |
| ability to use WhatsApp | Y | 50 | 4.68 | 0.653 | |
| | Z | 221 | 4.90 | 0.329 | **0.024** |

Many educators understandably believe that members of Generation Z are internet-savvy. But the results show that digital culture, not academic or digital tools for work, is the language of the centennials. In an online world, young people often have more advanced cultural skills. Their awareness of memes, social media

platforms and other forms of communication comes from an adolescence in which online socialisation was the norm. However, this style of learning does not often translate into the technical digital skills required in higher education.

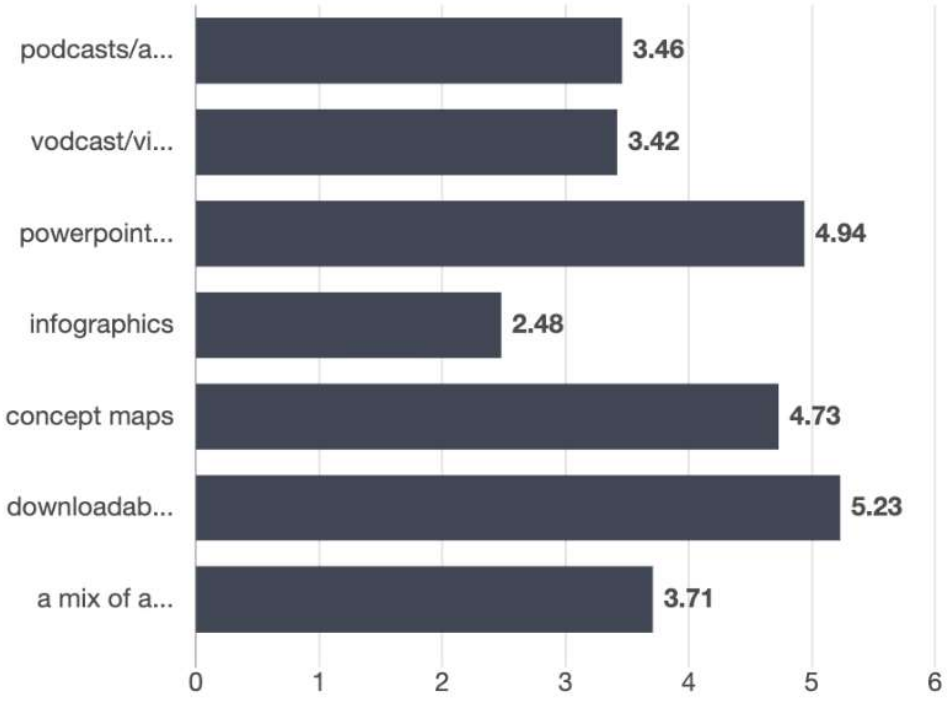
Moreover, students can arrive at university with dramatically different levels of technological readiness. While some students may have had computer and other technology courses at secondary school, others may struggle with simple tasks. And students' ability to learn digital skills has an impact on their academic progress. Too often, a person's age is assumed to imply that they are proficient in the use of digital tools. Because of this misconception, political and institutional organisations have long focused all their efforts and resources on equipping young people. Schools, universities, and governments have set themselves the goal of bridging the digital divide by providing every student with a device. But just because you have something does not mean you know how to use it.

Young people are suffering from a lack of discussion and misunderstanding of the concept of digital natives. Indeed, this hands-off approach is likely to have the greatest impact on young people who are already experiencing forms of social exclusion. Research suggests that there are significant differences in how young people use technology and the benefits they derive from it, and that these patterns are partly explained by socio-economic variables. In general, those who are less well-off have lower quality access to technology (e.g., owning a device, the suitability of the device for learning, the quality of the Internet connection at home, etc.), fewer people to support them (often because their parents or teachers do not have high levels of digital literacy), and fewer skills (because it is difficult to develop skills without access to technology or appropriate support). In France, media sociologist Fabien Granjon (2011) speaks of a 'second-degree digital divide' (*fracture*

*numérique*) to distinguish the issue of access to internet equipment from that of proper mastery. Two people born in the same year with identical equipment will not necessarily have the same ability to use software, conduct appropriate internet research or navigate through the information available. And the problem may be even more widespread among 'smartphone natives', people born after 2005 who have grown up with mobile applications that intuitively put the world at their fingertips.

The results of our study (Figure 2) and evidence from the literature (i.e., Shorey, 2021) converge on the importance of using content that incorporates technology (e.g., PowerPoint presentations, YouTube videos, concept maps, virtual simulations, podcasts, and computer and mobile applications) and online discussion groups (e.g., social media, blogs, forums, online surveys).

*Figure 2: Students' preferences for digital learning resources. Average value. Ranking from 1 (less useful) to 7 (most useful)*



This enables the creation of individualised and self-paced learning (e.g., flexible schedules), engaging and visual learning environments that integrate videos, stories, audio-enhanced PowerPoint slides, short instructions and simulations, concept maps. These resources should be integrated into the classroom by telling students what is expected of them and providing task-specific objectives. Active learning can be encouraged through self-directed activities, short instructions, storytelling and story-living to engage learners both theoretically and practically, and to work with teachers to prepare students for employment (Shorey *et al.*, 2021). A dynamic learning environment requires creative approaches that combine social interaction, technology, and tasks. The development of critical thinking, social and relational skills is then crucial.

Table 7 shows the comparison between the generations in terms of the dimensions structured by the Digiskill survey, and in this case the average scores are similar between Centellians and Millennials in each scale and subscale with no statistically significant difference between the two generations.

*Table 7: Differences in scale averages and Digiskill subscales between Centellians and Millennials generation. Group statistics*

| | Generation | N | Mean | Std. deviation | p-value T-test |
|---|---|---|---|---|---|
| DIGISKILL | Y | 50 | 5.3600 | 1.20410 | |
| | Z | 221 | 5.4532 | 0.85914 | 0.606 |
| Digital Skills Information - Access and Content Management | Y | 50 | 5.3280 | 1.28206 | |
| | Z | 221 | 5.2887 | 1.04521 | 0.818 |
| Digital Skills Use of digital media | Y | 50 | 4.9320 | 1.38835 | |
| | Z | 221 | 4.8814 | 1.13837 | 0.786 |
| Digital Skill - Information | Y | 50 | 5.1300 | 1.28639 | |
| | Z | 221 | 5.0851 | 1.02912 | 0.818 |

| | | | | | |
|---|---|---|---|---|---|
| Digital Skill - Communication | Y | 50 | 5.4933 | 1.53602 | |
| | Z | 221 | 5.6772 | 1.19104 | 0.353 |
| Digital Skill - Creation | Y | 50 | 4.9000 | 1.50472 | |
| | Z | 221 | 4.9593 | 1.30649 | 0.779 |
| Digital Skill - Digital Safety | Y | 50 | 5.5633 | 1.21540 | |
| | Z | 221 | 5.7926 | 0.92747 | 0.215 |
| Digital Skill - Digital Empathy | Y | 50 | 5.7720 | 1.24212 | |
| | Z | 221 | 5.9439 | 0.89143 | 0.358 |

Both groups show high scores in all subscales. The European Commission (2009) claimed that a digital-skilled person is someone who uses digital information and communication technologies creatively, critically, and safely, being able to adapt to a new set of knowledge and attitudes that are necessary for a digital society.

In general, information (the ability to effectively access and manage digital content using digital means) and digital content creation (the ability to create new content using digital media and tools) are areas where Centellians have slightly lower average scores. They report higher average scores in digital empathy (the cognitive and emotional ability to be reflective and socially responsible in the strategic use of digital technologies) and communication (the ability to communicate with others in digital environments).

Both generations report high digital safety skills, i.e., the ability to use the Internet and digital technologies safely and protect one's own privacy and wellbeing. Growing up in uncertain times, this generation is pragmatic, concerned and cautious about the future (e.g., physical, emotional and financial security) and the digital environment, so they are less likely to take risks and more likely to have options and alternative plans (Shorey *et al.*, 2021).

### *4.5 Differences between Millennials and Centennials in terms of the cognitive component of hedonic well-being, career adaptability, self-compassion, and perceived social support*

Using the Student's parametric t-test procedure for the difference of means in independent samples, in Table 8 we note the presence of significantly different mean scores between Generations X and Y only on the Self-Compassion scale, where Gen Z shows lower mean scores.

The MSPSS scale shows the highest mean scores for both the Y and Z generations. Research suggests that it is possible to consider perceived social support as a valuable protective mechanism that can enhance eudemonic well-being by promoting personal growth, autonomy, and cognitive flexibility that improves responsiveness to the demands of university life (recently, Cobo-Rendón *et al.*, 2020; Holliman *et al.*, 2021).

The two generational groups show very little difference in the different subscales of the Career Adapt-Abilities Scale (CAAS). In today's uncertain environment, adaptability is seen as one of the most valuable resources that people need to develop in order to thrive (Savickas & Porfeli; 2012; Di Maggio *et al.*, 2015; Rudolph *et al.*, 2017). From a preventive and resource-building perspective, career adaptability is also a key characteristic for young adults facing the challenges of the 21st century, and thus a valuable tool in the context of early careers and early transitions. Identified as a meta-competency, adaptability is one of the key concepts for academic and career success. However, there is still a lack of evidence on what works to motivate learners to develop digital adaptability skills.

*Table 8: Differences between Millennials and Centennials in terms of the cognitive component of hedonic well-being, career adaptability, self-compassion and perceived social support. t-test for difference in averages*

| | Generation | N | Mean | Std. deviation | **p-value T-test** |
|---|---|---|---|---|---|
| Hedonic well-being (SWLS) | Y | 50 | 4.4560 | 1.26235 | |
| | Z | 221 | 4.6018 | 1.15428 | 0.429 |
| Professional Adaptability (CAAS) | Y | 50 | 3.9117 | 0.59014 | |
| | Z | 221 | 3.8088 | 0.62210 | 0.288 |
| CAAS_INTEREST_FOR | Y | 50 | 3.7600 | 0.64167 | |
| | Z | 221 | 3.7775 | 0.72502 | 0.875 |
| CAAS_CONTROL | Y | 50 | 3.9267 | 0.68193 | |
| | Z | 221 | 3.7715 | 0.75223 | 0.182 |
| CAAS_CURIOSITY | Y | 50 | 3.8833 | 0.70087 | |
| | Z | 221 | 3.7421 | 0.75384 | 0.227 |
| CAAS_CONFIDENCE | Y | 50 | 4.0767 | 0.75233 | |
| | Z | 221 | 3.9442 | 074155 | 0.256 |
| Perceived Social Support (MSPSS) | Y | 50 | 5.8033 | 1.40837 | |
| | Z | 221 | 5.9265 | 1.06014 | 0.488 |
| Self-Compassion (SCS) | Y | 50 | 3.1859 | 0.66748 | |
| | Z | 221 | 2.9258 | 0.61190 | **0.008** |

Self-Compassion scale is the one where both Millennials and Centennials have the lowest mean scores, with a significant difference between the two groups, and GenZ report lower scores. This finding is in line with findings on mental wellbeing in Italy. According to the latest Mind Health Report (Axa, 2023), Italy is the country whose population is most affected in terms of mental health, with only 18% of the sample declaring a state of full wellbeing (Flourishing), a figure that is lower than last year (20%). Three years into the COVID-19 pandemic, Gen Zers report higher rates of anxiety, depression, and distress than any other age group. In fact, the Axa report (2023) shows that young people and

women (the subjects of our sample) are most at risk. Uncertainty about the future, loneliness and body image are all major concerns for young people. For 38% of young people, technology and social media also have a negative impact on their mental wellbeing. Only one in 12 young people report a state of complete mental well-being. At the same time, the report reveals a growing willingness to take care of one's mental health.

Studies have shown that self-compassion is helpful in counteracting both the negative effects of academic failure in university students and the onset of depressive symptoms in self-critical individuals (recently, Keutler, & McHugh, 2022), and that self-compassion-based treatments have a well-being enhancing effect as a result (see review by Kotera & Van Gordon, 2021). Both group and individual formats can work if the intervention is long enough (at least 4 sessions) and if it is a specific self-compassion intervention rather than short (e.g., 2 sessions) mindfulness training (Egan *et al.*, 2022).

*4.6 Correlation of digital security and/or digital empathy with the sensitivity of sensory processing and its dimensions*

The Pearson correlation matrix of coefficients, shown in Table 9, represents the correlations between the two dimensions of digital security and digital empathy with sensory processing sensitivity and its three dimensions, LST (low sensory threshold), AES (aesthetic sensitivity), EOE (ease of arousal).

Our first prediction, that aesthetic sensitivity – AES would be moderately correlated with the two dimensions of digital security and digital empathy was confirmed. Results from the online survey revealed a significant medium positive correlation between the HSP AES scale and digital security and digital empathy skills. Significant but smaller correlations are also reported between

digital security and digital empathy and the whole scale and the other two dimensions (LST and EOE).

*Table 9: Correlation of digital security and/or digital empathy with sensory processing sensitivity and its dimensions. Correlation matrix*

| | | HSP_EOE | HSP_LST | HSP_AES | Sensory processing sensitivity (HSP scale) |
|---|---|---|---|---|---|
| Digital Skill - Digital Security | Pearson correlation | 0.147* | 0.132* | **0.430**** | **0.276**** |
| | Sign. (two-tailed) | 0.013 | 0.026 | 0.000 | 0.000 |
| | N | 284 | 284 | 284 | 284 |
| Digital Skill - Digital Empathy | Pearson correlation | 0.143* | 0.135* | **0.558**** | **0.317**** |
| | Sign. (two-tailed) | 0.016 | 0.023 | 0.000 | 0.000 |
| | N | 284 | 284 | 284 | 284 |

** *Correlation is significant at the 0.01 level (two-tailed).*

These results have important implications for the study of personality and individual differences. In the future it would be helpful to have additional, more detailed quantitative and qualitative research to better understand the types of activities that individuals who are high on both SPS engage in that result in digital positive experiences.

## *4.7 Limitations*

Recruitment was by convenience sampling in only two universities. Although the sample size was adequate, a larger sample might have improved the generalisability of the results. On the other hand, it should be emphasised that the data were collected to serve as a baseline study, so that the universities themselves can evaluate their populations and improve the design of microlearning interventions, also through the associated factors

found in this study. The present study was designed as a cross-sectional study. Future studies could be designed as longitudinal and experimental, and mediating or moderating effects could be investigated. Longitudinal studies would also help to understand causality and develop more effective approaches.

### *4.8 Recommendations*

This study used a quantitative approach, which was certainly appropriate for the specific aims of the study. Future studies could include in-depth interviews with students or mixed methods to gain a deeper understanding of how digital literacy develops among university students.

Future research could also explore the relationships between digital literacy and other elements of education, such as the relationship between digital literacy and the adoption of blended learning models, digital literacy, and the use of digital tools for learning, digital literacy and academic performance, and so on.

The findings on self-efficacy with digital tools suggest that understanding students' experiences with different digital tools and their confidence in their ability to fully use them for learning is crucial as online learning alternatives become more common in higher education. However, it is important to recognise that the introduction of new educational technology (also edtech) creates a dual learning experience for students and that time needs to be spent ensuring that students are digitally prepared for success.

Teachers could be more deliberate in their choice of edtech and in explaining how and why they use it in their teaching. Students may not always have equal access to technology, so before introducing microlearning on devices that some students may not have, teachers need to ensure adequate access and

support. In addition, some subjects are too complex to be taught through microlearning alone. When using web-based learning, poorly planned objectives can be detrimental (e.g., De Gagne *et al.*, 2019). Higher education institutions can also do more to build students' confidence and technological skills by including edtech seminars in their mandatory new student orientation programmes.

Human and technical skills are expected to become increasingly intertwined. A new generation of digital skills is linked to other agentic competencies such as: adaptability, the capacity to (un)learn, and the ability to operate in complex environments, to name but a few. Adaptability can be seen as a key skill in today's rapidly changing world in general, and beyond the recent and current crisis. Nevertheless, educational research has primarily focused on how people deal with adversity and failure rather than change and uncertainty. More research is needed on students' adaptability, as this skill is important for student outcomes in higher education, including the emotions of achievement, which have not been studied in relation to adaptability and which affect student learning and achievement. While more research is needed to identify the processes through which adaptability influences student outcomes, increasing students' adaptability and preparing them for future difficulties involving uncertainty, novelty and change is critical to promoting personal and academic well-being in higher education.

As adaptability, digital intelligence and self-compassion are alterable and adaptive constructs, student development programmes should focus on improving or enhancing the adaptive skills of emotional regulation and promoting reciprocal social exchange (Holliman *et al.*, 2020; Holliman *et al.*, 2021). Universities could provide interventions to teach students how to identify new circumstances that may require regulatory responses (Erzen & Ozabaci, 2023); teach them how to make appropriate

cognitive, behavioural, and emotional adjustments; and assist students in noticing and processing the positive effects of these adjustments (Indani & Pratiwi, 2021). In terms of improving perceived social support, universities should encourage students to maintain and access social support networks (e.g., existing family and friends), although this may be more difficult if they are in another country. Institutions can also encourage the formation of friendships through organised activities, events, and initiatives (Cobo-Rendón *et al.*, 2020; Holliman *et al.*, 2021).

Comprehensive interventions based on self-compassion are limited in Italian educational contexts. Self-compassion is significantly negatively correlated with academic procrastination and dysfunctional attitudes (Keutler, & McHugh, 2022; Kotera & Van Gordon, 2021). Therefore, self-compassion education programmes may be a promising way to transform these attitudes into appropriate behaviours.

Theoretical frameworks could be considered when designing microlearning programmes. Indeed, more theoretical work would mitigate the ahistorical quality of much of the debate around young people and technology, and ideally provide a significant alternative to the digital native rhetoric.

More than just breaking down a three-hour recorded lecture into small chunks, microlearning is an action-oriented, technology-enabled learning format that transforms complex information into bite-sized, easily digestible chunks that learners can practice (Allela, 2021) and access when, where and how they want to learn. Its content is available in a variety of forms and delivery formats (Sankaranarayanan *et al.*, 2023). Future research should focus on evaluating higher levels of learning outcomes from different microlearning modalities (Fidan, 2023). Given the importance of microlearning in self-directed learning, educators, researchers, and designers need to explore how microlearning can

be promoted, created, and used to support learners on the right path to valid knowledge in an ethical way (Leong *et al.*, 2021).

Recent theories have also suggested that motivation (such as a learning mindset) can promote changes in traits (such as personality) (cf. Dweck, 2019), as our mindsets can promote a sense of fluidity in being. Focusing on expanding the current work on relation between digital intelligence and sensory processing sensitivity, further research is needed to confirm the current findings and understand how high SPS might be expressed and managed effectively online.

## *Conclusions*

One strategy for promoting digital learning in higher education (OECD 2021a, 2021b) is microlearning and micro credentials. As physical (physical plus digital, i.e., a combination of physical circumstances or tangible objects and digital or online) learning environments and microlearning become more promising and popular for use in the continuous learning, research into understanding the factors that drive intentions to use microlearning and the barrier to adoption is crucial to ensure that implementation efforts are not wasted.

While there is no 'one size fits all solution' and 'no magic bullet' (OECD, 2020a), some general lessons can be drawn from the international literature: raising awareness and making opportunities more accessible; engaging stakeholders and working together; overcoming barriers to learning; and improving the quality of learning. In addition, the literature review identified the following success factors associated with digital learning and microlearning in particular: (1) the design of online learning programmes (e.g. providing an easy-to-use digital platform); (2) the

level and type of support provided within online programmes (e.g. peer support, management support); and (3) measures associated with increasing learner engagement (e.g. promoting the benefits of online learning, setting achievable goals and personalising content).

Research on centennials is still ongoing and the needs of learners of all generations need to be considered and addressed. This study improves our understanding of the relative effectiveness of different factors in predicting intentions to use technology-enhanced tools and approaches in learning, and consolidates evidence on the characteristics, preferences and needs of Gen Y and Gen Z learners and how these needs can be supported, thereby dispelling myths about digital natives.

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