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PAPER

Empowering Digital Teaching Skills: Teachers' Perceptions of Web Tools Use in Online Education

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ABSTRACT

This study aims to explore Portuguese teachers' perceptions of their digital teaching skills, particularly regarding Web 2.0 tools for online instruction and learning. A total of 97 teachers participated in this quantitative research, responding to a questionnaire comprising 38 questions, including open-ended items for both in-service and pre-service teachers. The findings highlight the need to further develop digital competencies, especially in selecting and using open educational resources (OER) effectively. Teachers recognised the value of digital tools in enhancing both teaching quality and student learning outcomes. The results also underscore the importance of equipping educators with the skills to evaluate and apply relevant digital materials in their practice. Micro-credentials emerged as a strong motivator, with the majority of participants expressing interest in earning certification through professional development opportunities. This reflects a broader desire among educators to improve their digital expertise and advance their careers. The study offers both theoretical and practical insights for educational institutions, suggesting that investment in digital skill development and certification pathways can significantly enhance teaching effectiveness and learner engagement in digital contexts.

KEYWORDS

digital teaching skills, gamification, Web 2.0 tools, online education, micro-credentials

1 INTRODUCTION

In today's technology-driven education, effective technology use enhances teaching and learning while minimising risks (Alcaraz-Dominguez and Barbera, 2024). Technology should support education while mitigating potential drawbacks. Its growing role has increased the demand for teachers with strong digital skills, essential for preparing students and advancing professional development [1]. Web 2.0 tools are crucial for developing digital teaching skills, providing access to quality content, fostering collaboration, and transforming teachers into facilitators [2]. Widely used in foreign language education, they support multi-sensory material creation and enhance all four language skills, including creative writing [3]. Teachers increasingly

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integrate digital platforms into their strategies, balancing classroom dynamics by leveraging students' digital fluency.

Born into a connected world, today's students have never known life without the internet, they use mobile devices daily for communication, social interaction, and information sharing, often relying on emojis as part of their digital language [4]. Technology-driven teaching fosters personalised learning, giving students greater control over time and pace while adapting to their needs [1]. In subjects like mathematics, digital technologies and active methodologies, such as project-based learning and flipped classrooms, can transform instruction and improve outcomes [5]. The Empower Digi Teach Project aims to enhance teachers' digital competencies by developing gamified digital learning materials. It seeks to create a gamification-based learning management system integrated with a micro-credential framework, fostering motivation, collaboration, and engagement in professional development while improving teaching and learning practices. A team from four countries developed the project (2022-1-TR01-KA220-HED-000089215) to address this need. The system will be open-source, incorporating gamification and micro-credentials to encourage teacher participation through both collaboration and competition. A key objective of this questionnaire is to gather teachers' and teacher candidates' opinions on gamification, micro-credentials, and digital competence, shaping the design of the Empower Digi Teach online platform. Empowering teachers to design digital learning materials through gamification benefits both educators and students by enhancing learning experiences, encouraging professional growth, and fostering innovation in education.

This article is structured into nine sections: in section three, we provide an overview of the methodology used, including the measuring instrument, the data collection process, the quality assessment, and the study sample. Section four presents our main results, followed by section five, which discusses the results considering the existing literature. We conclude in section six with a summary of the main findings and proposals for future research. Finally, we present the limitations of our study in section seven, which could serve as a basis for further research in this area.

2 RELATED WORK

This section reviews key areas shaping digital education today: essential teaching skills for the digital age, the evolution of online learning tools from Web 2.0 to Web 5.0, and the role of gamification and micro-credentials in enhancing learner engagement.

2.1 Digital teaching skills

Digital teaching skills encompass the competencies educators require to effectively integrate digital technologies into teaching. This includes selecting appropriate digital resources for specific learning objectives and contexts, as well as empowering learners to use technology safely and responsibly [2]. These skills also involve organising and sharing digital content with learners, parents, and fellow educators [2] and [6]. The Digital Teaching Skills enhance learning outcomes by improving student engagement and comprehension through digital tools, including virtual reality (VR), which fosters immersive and collaborative learning [7] and [8]. Additionally, digital teaching supports flexible learning schedules and remote access to materials, promoting inclusive education [4]. Teachers must be digitally literate and continuously adapt to evolving technologies to meet students' needs [9]. Students develop essential 21st-century skills, such as digital literacy, critical thinking, and problem-solving,

through digital learning [10]. Educators should creatively incorporate diverse media and applications to enhance engagement [5]. Digital teaching skills enable innovative pedagogies like flipped classrooms and blended learning, fostering personalised education. However, teachers require adequate training to navigate second-language instruction effectively [9]. Moreover, 21st-century skills, including critical thinking, creativity, and visual communication, are becoming increasingly integral to English language teaching [11]. While digital teaching skills modernise learning, several challenges remain. Technological barriers persist, as many educators, particularly in underfunded schools and rural areas, lack access to essential digital tools [12]. Skill gaps and training also pose a challenge, with many educators lacking confidence in using digital tools. Although ongoing professional development is crucial, it is not always readily available [13]. Additionally, resistance to change among educators and institutions hinders the adoption of new technologies, often due to uncertainty, a preference for traditional methods, or unfamiliarity with the benefits of digital teaching [14]. Age-related barriers further complicate the transition, as older educators may struggle with digital adaptation due to lower digital literacy and reluctance to alter established teaching practices [15]. Despite these challenges, digital teaching skills are crucial for modernising English language education and ensuring teachers can effectively navigate the digital landscape [13], [15] and [12].

2.2 Tools for online education from Web 2.0 to Web 5.0

Web 2.0 tools include various online applications that enhance online education by improving the learning experience [16] and [17]. These tools foster student collaboration, communication, content creation, and interactive sharing. Commonly used Web 2.0 applications in education, such as Vox, Qik, Picasaweb, Prezi, Google Docs, and YouTube, support student-generated learning and promote social constructivist environments where learners actively engage and share knowledge [18]. Web 2.0 tools also facilitate assessment for learning, enabling feedback and self-assessment to improve learning outcomes [16]. Examples include blogs, wikis, and social media platforms such as Facebook and Twitter [19] and [4], which enhance collaboration and social presence in online learning [20]. Additionally, Twitter and Instagram have been explored for mobile learning scenarios [4]. Web 2.0 tools also impact academic publishing, improving visibility through user comments and feedback. However, some scholars remain hesitant, prompting the need for scientific editors to reassess their role in academic communication [21]. The benefits of Web 2.0 tools in education are well-documented, with research from 2020 to 2024 highlighting their role in student-centred learning. A survey found that 47% of students spend over 40% of their study time using Web 2.0 technologies [22]. These tools enhance collaborative knowledge construction, communication, and vicarious learning [23]. For instance, wikis in engineering education encourage collective intelligence and cooperation [24]. Web 2.0 applications such as Edmodo, Google Docs, Zoho Writer, blogs, wikis, and Facebook have been widely used in online education [3]. Other technologies include multimedia/video-assisted learning, digital games, computer simulations, comics, and Google Classroom, all of which support student engagement and collaborative learning [24] and [23]. The evolution of Web 5.0, the "sensory and emotive Web," marks a transformative shift in education. Web 5.0 fosters emotional intelligence and sensory interactions, moving digital learning from transactional to immersive experiences [3]. In higher education, this shift necessitates new competencies for educators and students. [25] highlight the importance of intra- and interpersonal emotional skills, essential for creating adaptive learning environments and

preparing graduates for a digitalised world. Web 5.0 also enhances lifelong learning and skill acquisition by offering personalised, immersive educational experiences [3]. Its adoption fosters collaboration, creativity, and social learning through tools like podcasts, blogs, wikis, and virtual platforms [26] and [11]. These technologies enhance academic engagement and integrate real and virtual environments, positioning Web 5.0 as a key driver for advancing Open Educational Resources (OER) and promoting access, collaboration, and innovation in teaching and learning [3].

2.3 Gamification and micro credentials

Gamification and micro-credentials have been prominent areas of focus; other significant topics have also been addressed. For instance, the importance of responding to reviewers' comments has been highlighted [27]. An exploration of reviewers' roles in the publication process underscores the value of disseminating research through peer-reviewed journals, even though these studies do not specifically address gamification or micro-credentials [28]. Studies highlight gamification's role in increasing student motivation and engagement by incorporating gameplay elements such as progress mechanics, player development, and narratives [29] and [30]. It also encourages self-directed and peer-to-peer learning, helping students adapt to modern instructional models [31]. By creating immersive and engaging experiences, gamification replicates the complexity of real-world subjects [30]. However, excessive gamification may reduce enjoyment of core content, requiring a balanced approach [31]. Overall, gamification is a powerful tool, but its effectiveness depends on careful implementation. Micro-credentials also offer significant benefits [32] and [33]. They enable personalised professional learning, supporting educators' self-efficacy and development based on their interests [32]. Their flexibility promotes lifelong learning, upskilling, and reskilling in higher education and workplaces [33]. Micro-credentials complement traditional education by offering flexible, self-paced learning and enhancing career prospects [34]. Integrating gamification with micro-credentials can further improve engagement, motivation, and learning outcomes by incorporating elements like points, badges, leaderboards, and challenges [35]. Micro-credentials enhance learning by making achievements tangible and fostering incremental progress [36]. Key factors influencing student preference for gamification include usefulness, engagement, immersion, and enjoyment [35]. Overall, research suggests that strategically integrating gamification and micro-credentials can enhance learning by increasing engagement, motivation, and knowledge retention, making education more effective and enjoyable [36].

3 METHOD

This research examined the responses of 97 teachers in Portugal to a comprehensive questionnaire. Of these respondents, 82 were female and 15 were male. The questionnaire comprised eight different parts, including some open-ended questions directed at both teachers and teacher candidates, with a total of 38 questions. The survey began with an informed consent form and included screening questions to determine the participants' teaching background. The main sections of the questionnaire explored various aspects of their experiences, focusing on key variables such as university innovation support (emotional, interpersonal, and resource support), intrinsic motivation, and innovative behaviour. Each item was rated using a 5-point Likert scale (1: Strongly disagree to 5: Strongly agree). Feedback, along with considerations of the specific context of Portuguese teachers, led to slight adjustments in the

questionnaire wording. The data from the survey were analysed descriptively, with responses presented as percentages and frequencies. Open-ended responses were classified inductively into emerging categories due to the small sample size, and sample quotations were used to support the qualitative analysis findings. Table 1 presents the dimensions of the questionnaire related to teaching and learning.

Table 1. Questionnaire dimensions about teaching and learning

Dimension	Question
Teaching and learning	Q1: How often do you use digital tools in your teaching practice? Q2: How often do you use digital tools in your teaching to provide students opportunities to collaborate on classroom tasks? Q3: What digital tools do you use for providing students opportunities to collaborate during their learning? Q4: How often do you use digital tools for making students responsible for their learning? Q5: What digital tools do you use for providing students opportunities for taking their learning responsibility?

Source: Authors' own study.

The dimensions of the questionnaire focusing on assessment practices and digital resources are detailed in Table 2.

Table 2. Questionnaire dimensions about assessment and digital resources

Dimension	Question
Assessment	Q6: How often do you use digital tools for summative assessment of student learning? Q7: How often do you use digital tools for formative assessment of student learning? Q8: What resources do you need to effectively design summative and formative assessment materials with digital tools in your classroom? Q9: How often do you use digital tools for collecting student data to provide evidence on student learning? Q10: What digital tools do you use to collect and analyse evidence on student learning? Q11: What resources do you need to effectively use digital tools to collect evidence on student learning? Q12: How familiar are you with the digital tools used in adjusting instruction with feedback from assessments to enhance student learning? Q13: What digital tools do you use to plan further actions during instruction?
Digital resources	Q14: How familiar are you with different search engines and online repositories for digital learning materials? Q15: How do you determine the relevance of digital learning materials for your students? Q16: What types of digital learning resources do you typically search for? Q17: How often do you develop digital learning resources to use in your classroom? Q18: How often do you modify digital learning resources to use in your classroom? Q19: What software or tools do you typically use to develop and modify digital learning materials? Q20: How do you ensure that the digital learning resources you create or modify are accessible for all students, including those with disabilities or special needs? Q21: How familiar are you with the ways to share organised digital content with learners, parents and other educators? Q22: How familiar are you with copyright rules? Q23: How familiar are you with OER (open educational resources)?

Source: Authors' own study.

The questionnaire dimensions focusing on gamification strategies and the implementation of micro-credentials are shown in Table 3.

Table 3. Questionnaire dimensions about gamification and micro-credential

Dimension	Question
Gamification-based learning management systems	Q24: How important is it to you that an online learning environment has elements of gamification? Q25: How important is it to you that an online learning environment demands competitiveness? Q26: How important is it to you that an online learning environment requires you to collaborate with your colleagues? Q27: How important is it to you that an online learning environment requires you to deal with problem-solving, critical thinking and decision-making situations? Q28: How important is it to you that you gain rewards (points, badges, leaderboards, and other virtual or tangible incentives) during your learning in an online learning environment? Q29: How important is it to you that an online learning environment requires you to interact with your colleagues during your learning?
Micro-credential	Q30: To what extent do you feel motivated when a professional development course gives you a certificate for your successful participation? Q31: How willing would you be to consider pursuing a micro-credential to enhance your skills or knowledge in your field? Q32: How important do you think that micro-credentials would be useful for advancing your career goals?

Source: Authors' own study.

To collect data for this research, a questionnaire was administered to 97 teachers in Portugal, including 82 females and 15 males. It comprised eight sections and included open-ended questions for both teachers and teacher candidates, totalling 38 questions. Before participation, all individuals were informed about the study's objective, the voluntary nature of their involvement, potential risks, and response confidentiality. Data collection occurred over a designated period. Teachers' responses to each questionnaire item were analysed descriptively and presented as percentages and frequencies. Open-ended responses were classified inductively into emerging categories, given the relatively small sample. For this report, qualitative assertions were supported with sample quotations. Researchers used SPSS 29.0 to determine variable distribution and calculate correlations where relevant. This approach ensured a thorough analysis of both quantitative and qualitative data.

This study's quality assessment was carried out using established methodologies to ensure the reliability and validity of the data collected. Key quality assessment criteria included the representativeness of the sample, the validity of the data collection tools, and the robustness of the data analysis methods. The study included 97 teachers in Portugal, with a majority being female (82 females and 15 males). This distribution was considered when assessing the sample's representativeness, ensuring that the findings could be generalised to the broader population of teachers in Portugal. The questionnaire used in the study consisted of eight distinct parts, including both closed and open-ended questions, totalling 38 questions. The development of the questionnaire was informed by established research guidelines to ensure content validity. Additionally, the inclusion of open-ended questions allowed for the collection of in-depth qualitative data, which was essential for providing a comprehensive understanding of the respondents' perspectives. The data analysis was performed using descriptive statistics to present the results in terms of percentage and frequency for the closed-ended questions. For the open-ended questions, an inductive approach was employed to classify the responses into emerging categories despite the relatively small sample size. This method ensured that the qualitative data was systematically analysed and interpreted.

In this study, 97 teachers voluntarily completed an online questionnaire. The sample included 82 women (84.5%) and 15 men (15.5%). Regarding teaching experience, 55 teachers (56.7%) had over 10 years of experience, 36 (37.1%) had more than 10 years, four (4.1%) had between five and 10 years, and one (1.0%) had less than five years. This convenience sample was non-probabilistic, and all participants consented to the use of their data for study dissemination.

4 RESULTS

The participants' responses to the questionnaire items were presented in tables and interpreted. Open-ended questions were analysed and illustrated with sample quotations.

Table 4. Frequencies of responses for the teaching and learning dimension

Database	1	2	3	4	5	Mean	Std. Derivation
Q1	0 0%	2 2.1%	15 15.5%	44 45.4%	36 37.1%	4.175	0.7639
Q2	1 1.0%	7 7.2%	25 25.8%	49 50.5%	15 15.5%	3.722	0.8508
Q4	2 2.1%	9 9.3%	28 28.9%	42 43.3%	16 16.5%	3.629	0.9390

Source: Authors' own study.

In the Table 4, the data for responses for the teaching and learning dimension of the questionnaire, with one decimal place for the percentage. Each score is accompanied by the absolute number of participants who selected that score for each of the questions. Most teachers use digital tools in their teaching practice often (45.4%) or very often (37.1%). Most use it frequently (50.5%) to provide students with opportunities to collaborate on classroom tasks, and 43.3% use digital tools to make students responsible for their learning.

According to responses from 69 teachers, various digital tools are utilised to facilitate student collaboration during learning. Prominent tools include Smart boards for interactive sessions; Google Classroom, Google Forms, and other Google extensions for structured assignments and feedback; and online quiz or game platforms such as Kahoot, Mentimeter, Quizizz, Wordwall, and Socrative for engaging assessments. Additionally, content creation platforms like Padlet, Wakelet, Canva, and Book Creator are popular for collaborative projects, while communication and video conferencing tools such as Teams, Zoom, and Google Meet are essential for real-time discussions and virtual classrooms. These tools collectively enhance the collaborative learning experience by providing diverse, interactive and engaging opportunities for students.

A survey of 96 teachers revealed a variety of digital tools used to provide students with opportunities to take responsibility for their learning. Commonly mentioned tools include Canva and Padlet for collaborative and creative projects and Quizizz, Flipgrid, Nearpod, Edpuzzle, and Wooclap for interactive assessments and engagement. Additionally, video and podcast creation tools are frequently utilised to enhance learning experiences, while Wordwall and Educaplay are popular for creating interactive educational activities. Moodle is also widely used as a comprehensive learning management system that supports various educational tasks and responsibilities. These tools collectively enable a more engaging and autonomous learning environment for students.

The data analysis in the table referring to the dimension "Assessment" reveals some key insights into the use and familiarity of digital tools among teachers. A considerable proportion of teachers (36.1%) use digital tools for summative assessment sometimes, followed by 23.7% who use them frequently. However, 16.5% of teachers rarely use these tools, and 7.2% do not use them at all. For formative assessment, 38.1% of teachers use digital tools often, and 25.8% always use them, indicating a higher adoption rate for this type of assessment. Regarding the collection of student data to provide evidence of learning, 35.1% of teachers use digital tools sometimes, and 30.9% use them frequently, while 17.5% always use these tools. When it comes to adjusting instruction with feedback from assessments, 39.2% of teachers are moderately familiar with digital tools, and 33.0% are familiar. However, 11.3% are slightly familiar, and 6.2% are not familiar at all with these tools, suggesting a need for further training and support. In the Table 5 are presented as requested, with one decimal place for the percentage. Each score is accompanied by the absolute number of participants who selected that score for each of the questions.

Table 5. Frequencies of responses for assessment dimension

Database	1	2	3	4	5	Mean	Std. Derivation
Q6	7 7.2%	16 16.5%	35 36.1%	23 23.7%	16 16.5%	3.258	1.1391
Q7	4 4.1%	8 8.2%	23 23.7%	37 38.1%	25 25.8%	3.732	1.0657
Q9	3 3.1%	13 13.4%	34 35.1%	30 30.9%	17 17.5%	3.464	1.0314
Q12	6 6.2%	11 11.3%	38 39.2%	32 33.0%	10 10.3%	3.299	1.0121

Source: Authors' own study.

In analysing the responses from 76 teachers on the digital tools and resources they use for facilitating student responsibility in learning and designing summative and formative assessment materials, it was found that a variety of resources are essential. Teachers indicated the need for devices such as computers, tablets, smartphones, and PCs with projectors. Additionally, they require technological kits for students, including laptops, internet-connected devices, and electrical outlets. A reliable internet connection is crucial, with a good signal and stable, reliable access both at school and personally being necessary. The software mentioned includes Geogebra, Microsoft Office, and Moodle, while online platforms like Google Forms, Google Classroom, Canva, Quizizz, Kahoot, Wordwall, Socrative, Mentimeter, Padlet, Prezi, Thinglink, Tinkercad, and Minecraft Education are utilised. Teachers also rely on digital learning materials sourced from various search engines, online repositories, digital textbooks from publishers such as Porto Editora, ASA, Raíz Editora, and Texto Ed., school digital resource libraries, and open educational resources.

Seventy-six teachers from various subjects and levels provided insights into their use of digital tools for facilitating student responsibility in learning and for collecting and analysing evidence on student performance. The responses indicated that teachers employ a diverse array of digital tools and platforms to enhance their teaching practices. For providing students with opportunities to take responsibility for their learning, teachers frequently use tools such as Google Classroom, Microsoft Teams, Padlet, Edpuzzle, Quizizz, and Nearpod. Digital assessment and quizzing are supported by tools like Google Forms, Quizizz, and Kahoot, which help in evaluating student progress. For collaboration and communication, educators rely on Google

Classroom, Teams, Flipgrid, WhatsApp, and email. To create and present content, teachers utilise Canva, PowerPoint, and various multimedia resources. For data analysis, tools such as Microsoft Excel, Microsoft Forms, and Google Forms are commonly used to gather and interpret student learning data. These findings underscore the necessity for a diverse range of digital tools to effectively support different aspects of teaching and learning in today's educational environments.

To effectively use digital tools to collect evidence on student learning, teachers identified the need for a variety of resources. These include devices such as computers, smartphones, and tablets, as well as a reliable internet connection (Internet/Wi-Fi). Essential software mentioned by teachers includes MS Excel, Moodle, and PowerPoint. Additionally, various online platforms were highlighted as crucial, including Google Classroom, Microsoft Teams, Padlet, Quizizz, Edpuzzle, Liveworksheets, Google Sites, Wakelet, Google Sheets, WhatsApp, Quizalize, Thinglink, TedEd, Kahoot, Flipgrid, Genially, Emaze, Canva, Nearpod, and Minecraft. Teachers also pointed out the necessity of digital educational resources from publishers like Porto Editora, ASA, Raíz Editora, and Texto Ed., along with OER. The data underscores the importance of internet access and digital devices in the pedagogical practices of teachers, enabling them to utilise a range of digital tools effectively in their teaching and assessment processes.

The analysis of responses from 64 teachers who teach various subjects and levels highlights the diverse digital tools utilised during instruction. Teachers reported using a range of collaboration and communication tools such as Google Keep, Email/Messenger/WhatsApp, Google Sites, SharePoint, and Dropbox Paper to plan and coordinate instructional activities. For quizzes and assessments, they prefer platforms like Quizzes, Mentimeter, Kahoot, Wordwall, and Quizizz. In terms of content creation and design, tools such as Canva, Genially, GeoGebra, Google Forms, QuickRubric, Nearpod, Edpuzzle, Prezi, Padlet, Wakelet, Cracht, ClassPoint, and Popplet are commonly employed. Additionally, digital resources provided by the school or publishers, like Aula Digital and Escola Virtual, are integral to their instructional planning. Other digital platforms and resources frequently mentioned include Educaplay, YouTube, and Vimeo. These findings indicate that teachers rely on a multifaceted approach, incorporating various digital tools to enhance their instructional strategies and effectively engage students. In the Table 6, are presented as requested, with one decimal place for the percentage. Each score is accompanied by the absolute number of participants who selected that score for each of the questions.

Table 6. Frequencies of responses for the digital resources dimension

Database	1	2	3	4	5	Mean	Std. Derivation
Q14	2 2.1%	8 8.2%	44 45.4%	30 30.9%	13 13.4%	3.454	0.916
Q17	4 4.1%	8 8.2%	33 34.0%	38 39.2%	14 14.4%	3.515	0.9802
Q18	9 9.3%	7 7.2%	29 29.9%	40 41.2%	12 12.4%	3.402	1.0960
Q21	1 1.0%	14 14.4%	34 35.1%	32 33.0%	16 16.5%	3.495	0.9696
Q22	3 3.1%	13 13.4%	28 28.9%	35 36.1%	18 18.6%	3.536	1.0415
Q23	18 18.6%	25 25.8%	27 27.8%	20 20.6%	7 7.2%	2.722	1.1967

Source: Authors' own study.

Here the most important item or result from the table above should be indicated that only 2.1% of teachers consider themselves "Extremely Familiar" with different search engines and online repositories for digital learning materials, and 45.4% believe themselves "Familiarised". A significant portion of professors (30.9%) is in the intermediate category "Neutral", indicating that they may have some familiarity but not enough to consider themselves fully qualified. Regarding the frequency of developing digital resources for use in the classroom, most teachers (39.2%) answered "Frequently", indicating that they regularly create digital resources for their classes. Most teachers (41.2%) reported that they modify digital resources regularly to meet the needs of their classes, and 29.9% of teachers feel "Familiar" with this practice. Similarly, most teachers (33.0%) feel "Familiar" with ways to share organized digital content with students, parents and other educators. Having to record 16.5% of teachers consider themselves "Extremely Familiar" with these forms of sharing. Regarding knowledge about copyright rules, 36.1% of teachers consider themselves "Familiarised", and 28.9% of teachers are in the intermediate category "Neutral," with only 3.1% of teachers being in the "Not Familiar" category. The largest share of teachers (25.8%) is in the category "Familiarised" with OER. These data indicate that most teachers are familiar with using and creating digital resources for their classes and are also relatively familiar with ways of sharing organised digital content. Eighty-three teachers from various subjects and levels responded to the question about the types of digital learning resources they typically search for. The findings highlight a diverse need for resources, including visual, interactive, and accessibility-focused materials. Visual resources like infographics and visual presentations, as well as educational videos for concept presentation and explanation, are highly sought after. Teachers also frequently look for podcasts and audio resources, which are useful for storytelling or expert interviews. Interactive and gamified resources, such as educational games, interactive simulations, online quizzes, and tests, are essential for engaging students. Additionally, collaborative online tools for group work are in demand. Teachers also utilise online learning platforms with interactive lessons and multimedia resources to enhance their teaching. Lastly, there is a significant emphasis on accessibility and inclusivity resources, with adaptations like larger font sizes for visually impaired students, ensuring that the digital resources cater to students with special needs.

Teachers use diverse software and tools to develop and modify digital learning materials. Standard tools include Google Forms, Microsoft PowerPoint, Google Slides, Canva, Genially, and quiz-making platforms like Quizizz and Kahoot. These tools enable them to create interactive quizzes, engaging presentations, infographics, and visual resources that cater to the different learning needs of their students. These tools allow for easy sharing and collaboration with students, making it convenient for teachers and learners to access and engage with the materials. Additionally, teachers mention utilising video editing software like Camtasia and Clipchamp and audio editing tools like Audacity to adapt and enhance audiovisual content. Teachers take various measures to ensure that the digital learning resources they create or modify are accessible to all students, including those with disabilities or special needs. These measures include personalising materials for each student's characteristics, using platforms like Google Classroom or Teams to share resources securely, and adapting materials based on individual student needs. Additionally, they emphasise simplifying language and using tools that aid in accessibility, such as infographics, images, and transcripts for videos and audio. They also ensure clear navigation and organisation of materials to facilitate ease of use for students with

cognitive or attention difficulties. Teachers actively seek feedback from students, including those in special education, to make improvements and collaborate with education specialists to address the specific needs of their diverse learners. In the Table 7 are presented as requested, with one decimal place for the percentage. Each score is accompanied by the absolute number of participants who selected that score for each of the questions.

Table 7. Frequencies of responses for gamification-based learning management systems dimension

Database	1	2	3	4	5	Mean	Std. Derivation
Q24	1 1.0%	9 9.3%	34 35.1%	36 37.1%	17 17.5%	3.608	0.9192
Q25	3 3.1%	18 18.6%	35 36.1%	33 34.0%	8 8.2%	3.258	0.9605
Q26	0 0%	6 6.2%	11 11.3%	49 50.5%	31 32.0%	4.082	0.8250
Q27	0 0%	3 3.1%	9 9.3%	49 50.5%	36 37.1%	4.216	0.7392
Q28	2 2.1%	16 16.5%	29 29.9%	36 37.1%	14 14.4%	3.454	1.0002
Q29	0 0%	8 8.2%	19 19.6%	42 43.3%	28 28.9%	3.928	0.9042

Source: Authors' own study.

The data analysis in the table referring to the dimension 'Gamification-based Learning Management Systems' allows observing some trends and perceptions of teachers concerning the elements of gamification and interaction in online learning environments. Most teachers (54.6%) value including gamification elements in the learning environment, indicating that this can be an effective strategy to engage students. About 42.2% of teachers value competitiveness, but most do not consider it as crucial as other gamification elements. Collaboration with colleagues in online learning environments is highly valued by the majority of teachers, with 82.5% rating it as either "Important" (50.5%) or "Extremely Important" (32.0%). This high valuation highlights the importance of collaborative work for student learning and the professional development of teachers. Data indicate that 87.6% of teachers value the presence of problem-solving and critical-thinking situations in the online learning environment, classifying it as "Important" (50.5%) and as "Extremely Important" (37.1%). This suggests that teachers believe these situations are crucial for developing students' abilities. Most teachers (66.8%) value the presence of rewards and incentives in the online learning environment, rating this as "Important" (37.1%) and as "Extremely Important" (29.9%). Rewarding can be an effective motivational strategy to keep students engaged and reward their progress. Again, most teachers (72.2%) value interaction with peers while learning in online environments, rating it as "Important" (43.3%) and as "Extremely Important" (28.9%). This interaction is considered valuable for enriching the students' learning experience. Table 8 is presented with percentages rounded to one decimal place. Each score is accompanied by the absolute number of participants who selected that score for each question.

Table 8. Frequencies of responses for micro-credential system dimension

Database	1	2	3	4	5	Mean	Std. Derivation
Q30	0 0%	6 6.2%	12 12.4%	39 40.2%	40 41.2%	4.165	0.8742
Q31	1 1.0%	4 4.1%	18 18.6%	36 37.1%	38 39.2%	4.093	0.9138
Q32	2 2.1%	5 5.2%	18 18.6%	40 41.2%	32 33.0%	3.979	0.9572

Source: Authors' own study.

Here the most important item or result from the table above should be indicated. These results indicate that a significant majority of participants feel motivated (40.2%) or very motivated (41.2%) when a professional development course offers a certificate for successful participation, resulting in a mean score of 4.165 with a standard deviation of 0.8742. Furthermore, most participants are willing to consider pursuing a micro-credential to enhance their skills or knowledge in their field, with 37.1% indicating willingness and 39.2% indicating strong willingness, leading to a mean score of 4.093 and a standard deviation of 0.9138. Additionally, participants find micro-credentials to be important (41.2%) or very important (33.0%) for advancing their career goals, reflected in a mean score of 3.979 and a standard deviation of 0.9572. This shows a strong overall positive perception and willingness towards micro-credentials among the respondents.

5 DISCUSSION

The analysis of teacher responses to the use of digital tools in educational settings reveals a significant integration of these technologies in daily teaching practices. A considerable proportion of teachers frequently utilise digital tools, with 45.4% using them often and 37.1% very often in their teaching. These tools are employed not only for delivering content but also for fostering student collaboration, with 50.5% of teachers frequently providing opportunities for students to work together on classroom tasks. Additionally, 43.3% of teachers report using digital tools to encourage students to take responsibility for their own learning. This reflects the growing importance of digital teaching skills in modern education, as highlighted by [2], [6] and [38], who stress the necessity for educators to be proficient in selecting and utilising appropriate digital resources to enhance learning outcomes. The data reveal a diverse use of digital tools to foster student collaboration and responsibility. Smart boards, Google Classroom, and platforms like Kahoot and Quizizz enhance engagement and interactivity, supporting the findings of [7] and [8] on immersive, collaborative learning. Additionally, content creation tools such as Canva and Padlet indicate a shift towards innovative teaching methods that promote student creativity and ownership of learning, a key aspect of modern education [5] and [11]. In terms of assessment, the data reveal varying levels of familiarity and usage of digital tools among teachers. While a significant number of teachers use digital tools frequently for formative assessment (38.1% often, 25.8% always), there is less frequent use for summative assessment, with 36.1% using them sometimes and 16.5% rarely. This suggests a potential area for professional development, as highlighted by [13], who emphasise the need for ongoing training to bridge the skill gaps in digital

tool utilisation. The importance of digital teaching skills is further reinforced by the fact that 39.2% of teachers are only moderately familiar with using digital tools to adjust instruction based on assessment feedback, indicating a need for enhanced support and training in this area [9]. Teachers also reported a range of resources necessary for effectively integrating digital tools into their teaching practices. Essential resources include devices such as computers and tablets, reliable internet access, and various software and online platforms. The use of tools like Moodle, Google Classroom, and Microsoft Office is widespread, demonstrating their importance in supporting diverse educational tasks and responsibilities. This highlights the critical role of digital infrastructure in facilitating effective teaching and learning, as noted by [12], who discuss the technological barriers faced by educators, particularly in underfunded or rural areas. Moreover, the data underscore the importance of accessibility in digital learning environments [24]. Teachers emphasise the need to personalise materials for students with special needs and to ensure that digital resources are easy to navigate and use. This focus on inclusivity aligns with the findings of [4], who advocate for flexible and accessible education facilitated by digital technologies.

In the context of gamification and micro-credentials, the findings suggest that these strategies are increasingly valued in educational settings. The inclusion of gamification elements in learning environments is appreciated by 54.6% of teachers, who see it as an effective way to engage students. The importance of collaboration and problem-solving in online environments is also highlighted, with 87.6% of teachers valuing these aspects. This reflects the growing recognition of gamification as a powerful tool for enhancing student motivation and engagement, as supported by [29] and [30]. However, the data also suggest the need for careful implementation to avoid potential drawbacks, such as diminishing the core learning content, as noted by [31]. The positive perception of micro-credentials among teachers is evident, with a significant majority motivated by the prospect of earning certificates and willing to pursue micro-credentials to advance their skills. This supports the view that micro-credentials offer valuable opportunities for personalised professional development, as discussed by [32] and [33]. These findings indicate a strong overall acceptance of micro-credentials as a means to enhance educator efficacy and career progression. Overall, the data suggest that the effective integration of digital tools, gamification, and micro-credentials can significantly enhance educational practices. However, there is a need for ongoing support and training to ensure that teachers are fully equipped to leverage these technologies to their full potential, ultimately leading to improved student outcomes and a more engaging learning experience.

6 CONCLUSION

This study aims to understand teachers' perceptions of their digital teaching skills with Web 2.0 tools for online teaching, training, and learning. The analysis reveals a substantial integration of these technologies into daily educational practices. Many educators frequently use digital tools not only for content delivery but also to foster student collaboration and learner autonomy. This underscores the growing importance of digital competencies in modern education, particularly in effectively integrating technology to enhance learning outcomes [37]. However, while teachers are adept at using digital tools for formative assessment, their application in summative assessment remains limited, highlighting the need for further professional development [13]. Adequate digital infrastructure and accessible resources are crucial to

ensuring all students, including those with special needs, benefit from technological advancements [4]. The increasing acceptance of gamification and micro-credentials reflects a shift towards innovative teaching strategies that enhance student engagement and motivation [29] and [30]. However, careful implementation is necessary to prevent drawbacks, such as diminished focus on core learning content [31]. While teachers are willing to embrace digital tools, ongoing support and targeted training remain essential to maximise their potential in improving educational outcomes.

Web 5.0 tools offer new opportunities to engage students on deeper, more personalised levels by integrating emotional, sensory, and immersive technologies. These advancements could enhance online learning by making education more interactive, inclusive, and experiential. However, the study found that Web 5.0 tools were rarely mentioned by participants, suggesting limited adoption in current educational contexts. This highlights a promising area for future research, as integrating Web 5.0 technologies could address gaps in existing practices and enrich teaching and learning experiences. As noted by [25], the sensory and emotive Web requires educators to develop emotional competencies and adapt to new tools to create meaningful and engaging learning environments, reinforcing the need for further exploration [20].

Our findings highlight the need to further develop teachers' digital competencies, particularly in using open educational resources and assessing material relevance. The crucial role of digital tools in enhancing teaching and learning underscores the importance of equipping educators with the necessary skills to maximise their effectiveness [1], [2] and [6]. While micro-credentials are gaining traction, many participants feel motivated by certification in professional development courses. Among the 97 respondents, a significant number expressed interest in pursuing micro-credentials to advance their careers [32] and [33]. However, to fully leverage digital teaching, challenges such as technological barriers, skill gaps, resistance to change, age-related factors, and increased workload must be addressed. The integration of digital teaching skills is vital for modern education, offering benefits in learning outcomes, accessibility, and essential skill development [10]. Nonetheless, these challenges must be carefully managed to ensure that digital tools effectively support teaching and learning [12] and [15].

7 LIMITATIONS OF STUDY

Our study provides valuable insights but presents some limitations. The small, non-probabilistic sample of 97 teachers, mostly female, restricts the generalisability of findings to the broader Portuguese teaching population. Using self-reported questionnaire data may introduce bias, as responses could reflect social desirability rather than actual experiences. Although insightful, the qualitative analysis is limited by the small sample size, reducing the depth of findings. Future research should involve a larger, more diverse, probabilistic sample for better representativeness. Incorporating mixed methods, like interviews or observations, would enhance data triangulation and understanding. In-depth interviews could further enrich on teachers' experiences.

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