Recommendation Tool for Use of Immersive Learning Environments

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***Abstract*— In the field of immersive learning, instructors often find it challenging to match their pedagogical approaches and content knowledge with specific technologies. Unfortunately, this usually results in either a lack of technology use or inappropriate use of some technologies. Teachers and trainers wishing to use immersive learning environments face a diversity of technological and pedagogical alternatives. To scaffold educators in their planning of immersive learning educational activities, we devised a recommendation tool, which maps educational context variables to the dimensions of immersion and uses educators' contexts to identify the closest educational uses. Sample educational activities for those uses are then presented, for various types of educational methodologies. Educators can use these samples to plan their educational activities in line with their current resources or to innovate by pursuing entirely different approaches.**

Index terms—immersive learning, immersive environments, recommendation tool

I. Introduction

Due to the recent COVID-19 pandemic situation around the world, society is more aware of the advantage of and dependence on digital technologies, experiencing a unique evolution of digital maturity, as reported in newspapers [1], and in reports of advisory bodies and think tanks [2-3]. Society has also embraced more disruptive technologies in traditional domains, such as training and education, including virtual, mixed, extended, and augmented reality (VR/MR/XR/AR) [4], commonly considered as immersive technologies that present vast potential for simulations of activities in the physical world, as they become less expensive and more diversified. These technologies can also be of paramount importance to foster higher order thinking skills such as students' autonomy, collaboration, active learning, and emancipation. It is thus essential to clarify how we can benefit from them in education, considering, as Elmqaddem argues, that "when applied properly, these technologies can create enhanced contemporary educational environments and enriched learning opportunities" [5]. A wide range of devices, including wearables, support the use of immersive environments and stimulate different senses and emotions, which may be relevant features for training and education contexts [6]. This has been changing instructional scenarios, creating unique opportunities [7]. However, a critical challenge is identifying suitable methods to deliver these courses for the educational or training purposes and objectives defined [8].

Considering the entire mixed reality spectrum, it is possible to find different approaches, each presenting its pros and cons depending on a variety of factors. In line with this, instructors often do not know how to leverage immersive technologies to implement immersive learning environments. An immersive learning environment (ILE) considers three dimensions of immersion: one is the feeling of presence within a space provided by immersive technologies, another is the psychological absorption provided by narrative aspects, and yet another the psychological absorption originating from mental engagement while exerting agency, such as completing challenges, making decision, or collaborating with others [26].

Further, ILEs need instructors to ponder other aspects, such as where or how to collect/generate educational material, or how to plan and deploy innovative training/educational courses based on immersive technologies. There is also a lack of knowledge on how to leverage existing technological capabilities with the common low technical skills possessed by most instructors. "The balance between the required efforts and expected benefits provides presumably the basis for decision-making on the implementation of simulation-based training" [9]. Selecting suitable approaches for a specific instructional context is critical to guarantee the program's success.

In this paper, we present the prototype of a recommendation system as a decision-support tool to minimize these barriers to the adoption of immersive environments in education and training. It employs a questionnaire to capture the educational or training context in terms of its resource constraints and objectives, i.e., following Kloke & Thoben's suggestion of balancing efforts and benefits [9]. The tool then situates this context on the conceptual space of uses of immersive environments and locates the types of educational uses closest

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to that context. For those, sample educational practices are provided for four different educational approaches. These can be used by the instructor as inspiration and guidance to plan their courses leveraging ILEs.

II. Background

A. Technology Integration into Instruction

Integrating technology into instruction is not easy for instructors. Technology integration literature contains multiple accounts of its scarcity, or obstacles to integration, or the lack of effects on student learning. Why is this so difficult? Mishra & Koehler [10] suggest that technology integration is a 'wicked problem'. Wicked problems are unique, often containing contradictory or incomplete requirements, and situated in complex social contexts [11]. Solutions often require the use of expert knowledge to author solutions which will achieve a good outcome. Therefore the mere use of technology in the classroom most often results in no change in outcomes [12]. Instructor technology integration involves much more than software and hardware fluency - it requires a grasp of interconnections between students, technologies, and pedagogical practices. Specific technologies have affordances, or strengths, that work best in specific social contexts, with specific users, pedagogical methods, and academic content. Also in the domain of technical training, the balancing of effort and benefits is complex, depending on many diverse factors: training risks, training availability, performance transparency, training adaptability, technological limitation and financial limitations: capital costs, recurrent costs, training costs [9].

The COVID-19 pandemic has greatly increased interest in the use of technology in education. Instructors have been forced to adopt either a fully online or blended instructional approach. Fortunately, research has produced several evidence-based models for technology integration, including the Technology, Pedagogy, and Content Knowledge Model (TPACK) [13], Technology Integration Matrix (TIM) [14], Replacement, Amplification and Transformation (RAT) [15], and the Substitution, Augmentation, Modification, and Redefinition (SAMR) model [16]. However, although these models have been helpful to a minority of instructors, many do not utilize them due to a variety of reasons, including time constraints, unavailable resources, inadequate instructions, need for training and support, and fear of technology [17], [18]. The nature of technology integration as a wicked problem and the lack of use of technology integration models point to the need to scaffold teachers in their technology integration [19] through the development of a recommendation tool for technology integration into instruction.

Instructors using immersive environments face a similar version of the challenges of integrating technology into instruction. These are found in three major categories: access to immersive environments; producing immersive content; and deployment [20]. Two recent surveys provided insights on this. One was a worldwide survey of the Immersive Learning Research Network (iLRN) community that ranked as a research priority deployment (linking immersive environments with learning systems or tasks) and content production by non-technical users, [8]. Another was a survey of experts on training with virtual reality (VR) [11], which also identified deployment and end-user content production as decisive factors. This survey also identified an access factor: hardware for smaller organizations. This emphasis on deployment factors also matches the literature on the wider challenges of integrating games in education: they are hard contexts for teachers to plan time allocation and tasks, plan students' activities, be aware and keep track of students' activities, and orchestrate learning (e.g., by assessment and feedback) [21].

B. Immersion Dimensions and Usage Clusters of ILEs

The integration of immersive environments into instruction requires an understanding of the concept of immersion, often left undefined in technology-centric literature. The past several decades provided two main approaches to understanding immersion, either as an attribute of a technical system [22] or as a psychological state based on an individual's perceptions [23]. Recent reviews by Agrawal et al. [24] and Nilsson et al. [25] demonstrated these two approaches lacked important dimensions of immersion from the literature in other areas, such as narrative, the ability to create "a degree of mental absorption or intense preoccupation with the story, the diegetic space, and the characters inhabiting this space" (ibid.); and the challenges one faces, leading to "absorption brought about by the experience (...) requiring mental or sensorimotor skills" (ibid.). Nilsson et al. conceived of narrative, challenges, and technology along three dimensions of a conceptual cube - the immersion cube framework.

Beck et al. [26] used this approach to immersion and situated the uses of immersive environments for learning within Nilsson et al.'s immersion cube framework. Although there are many ways to interpret and organize instructional uses of immersive environments, the authors provide an inductively derived list that can be used to better understand the intersections of the different types of immersion (e.g., technical, narrative, and challenge) and various instructional uses. They found 16 use typologies or simply "uses", grouped under six different clusters found along the three axes. We are employing Beck et al.'s [26] sixteen uses as mapped into Nilsson et al.'s immersion cube framework in the development of this tool, as described in the next sections.

C. Pedagogical Practices

There is a wide diversity of pedagogical practices adopted by educators. Torres et al. proposed a global taxonomy of educational processes for higher education [27], providing a framework for combining pedagogical work modes, learning approaches, and assessment types. Thus, it supports pedagogical planning by enabling educators to integrate teaching, learning, and assessment, guiding reflection on educational strategies.

In this work, we selected from that framework four combinations, representing pedagogical methodologies that are commonly used in education and training (Table 1).

Learning is a complex process that can occur in different ways and according to various objectives. So, we recommend that an educational strategy be specified for each use of the immersive training platform. To do this, it is necessary to define the expected learning outcomes and objectives, target population, material and technical conditions, and assessment procedures [28] [29].

TABLE I. EDUCATIONAL APPROACHES USED

Expository method	Transmission of information and knowledge; presentation of contents, themes, subjects	Behavioral learning
Interrogative method	Logical sequence of questions to lead to discovery of information and conclusions	Cognitive learning
Demonstrative method	Presentation of procedures and conducts to show how something is done, to replicate	Cognitive/behavioral learning
Active method	To raise consciousness and voluntary action to produce knowledge, represent situations, and perform roles	(Socio)constructivist learning

To facilitate this task, we create a single set of questions:

1) Define the expected learning outcomes and objectives: what to know, know-how, know-how to be, and for what purpose (knowledge, skills, attitudes)?

2) Define target population: what are the needs and expectations of individuals, the characteristics of their initial profile, previous levels of knowledge, and experience?

3) Provide for material and technical conditions: where, for how long, by what means? What VR system(s) (and AR) are expected to be used, and in what way?

4) Predict the evaluation training: how will the achievement of learning outcomes be demonstrated? (Results?) How will the training quality be evaluated? (Satisfaction?)

III. METHODS

To create a recommendation tool, we started by considering the instructional context regarding the various categories of challenges mentioned above: access, production, and deployment. This was done by developing a questionnaire on several aspects of these challenges, based on empirical and theoretical knowledge [30]. A tentative form was developed, with a set of questions matching aspects of the categories, asking instructors to respond on a Likert scale how they relate to each aspect. This questionnaire was then subjected to expert feedback [30], leading to correction and changes, over several iterations.

Given the lack of literature on a right vs. wrong approach to employ immersive learning environments (as mentioned in the background), we determined that the existence of accounts of use in the literature would provide a practitioner perspective on how to use them. First, because the existence of such a cluster of uses indicates that researchers and practitioners have considered its feasibility. And second, because those same accounts indicate that an instructor can readily locate and use them for guidance and inspiration.

Thus, the next step in developing the tool was establishing a relationship between the instructional context and the usage clusters. We followed Beck et al.'s approach of interpreting this within the immersion cube framework [25]. We conducted an inter-rater vetting process [31] to establish relationships between the questions in the previous questionnaire and the dimensions of immersion, debating divergences between raters until consensus was reached. The raters for this process were the six researchers who are authors of this manuscript, who possessed both technical and pedagogical expertise in the area of immersive learning. For instance, if a rater would find that there was not relationship between a question on available time for activity planning and the Narrative Immersion dimension, it would be established as zero (0); if that rater would find the relationship to be direct (i.e., the more time to plan, the more narrative), it would be established as one (1). And if that rater would find that relationship to be inverse (i.e., the more time to plan, the less narrative), it would be established as negative one (-1). We then multiplied these relationship factors by the Likert responses about the instructional context, added them for each immersion dimension, and then scaled this to the 0-1 range. This process enabled us to reach a set of three values situating the instructional context alongside each of the axes of the immersion cube framework. Beck et al. 's "use clusters" are also situated in this cube framework, so we can directly measure the distance between each use cluster and the instructional context as a Euclidean distance, as described in the next section. This enables ranking the use clusters per proximity to the instructional context according to the immersion cube framework.

Finally, to support teachers and trainers in deciding how to consider those uses for their pedagogical preferences, we provided a matrix of examples across four main educational method categories (Expository, Interrogative, Demonstrative, and Interactive, see section 2.3).

This tool was then tested with several different instructional scenarios: two cases within our research group (welding training and remote consultancy), three from the EIT Manufacturing pilots (Energy, Food and sustainability, and Escape Game Tank Problem), and one from a masterclass at the Future of Learning 2021 conference (onboarding process of a company). These tests consisted in asking a volunteer trainer in each case to consider an instructional scenario for which he/she required support planning how to employ immersive learning, and then employing the tool, following its various phases. We discussed with the respondents their perspective and opinions during the various phases, to collect feedback about the process and the results

IV. RESULTS: THE RECOMMENDATION TOOL

Following the method presented in the previous section, the recommendation tool follows the workflow presented in Fig.1. First the teaching/training context is identified via a questionnaire; then that context is situated within the immersion cube, and its distance to known uses of immersive learning is measured. The uses are then ranked by proximity, and the three closest ones highlighted. For each use, the instructor can then access a matrix of examples of their application using different pedagogical approaches. These can then be used to inspire instructor practice or educational planning.

For Phase 1 (Instructional Context Identification), we employed the questionnaire, with each question related to the immersion dimensions, as described in the previous section, as shown in Fig. 2. As an example, the fourth question in Fig. 2

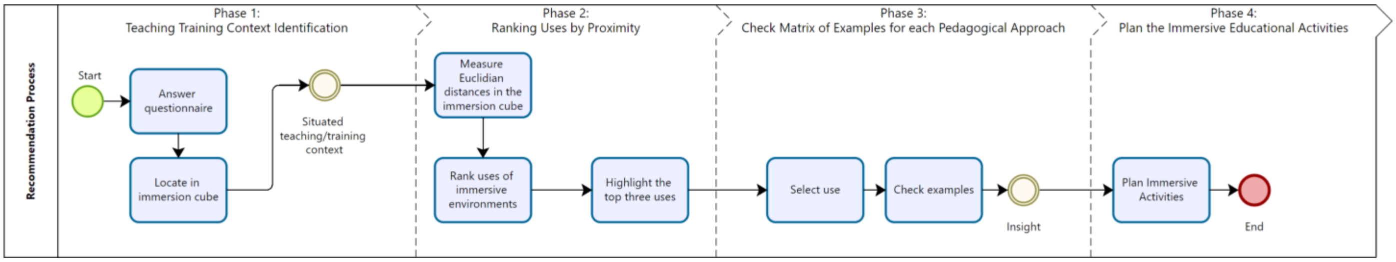

Fig. 1. The workflow of the recommendation tool for use of immersive learning environments.

focuses on the learner's level of experience with the planned learning content. The interrater process resulted in no relation between this aspect and System immersion (uses of immersive environments where the learner feels present within an environment), meaning our raters agreed that this aspect will not impact the level of system immersion recommendation. However, the interrater process revealed a direct relationship to Challenge-based immersion. This means that the tool will recommend that if learners are more experienced with the subject matter content, then the instructional context should be closer to uses of immersion that leverage challenge aspects more, i.e., activities that require learners to interact more, to engage more, to be absorbed in tasks.

TABLE II. SAMPLE QUESTIONNAIRE RESPONSE AND MATCHING OUTCOMES FOR EACH DIMENSION

Question aspect	Sample Answer	System	Narrative	Challenge
Time available	1	0 x 1 = 0	1 x 1 = 1	0 x 1 = 0
Depth	1	1 x 1 = 1	1 x 1 = 1	1 x 1 = 1
Duration	2	0 x 2 = 0	0 x 2 = 0	1 x 2 = 2
Learner's experience	3	0 x 3 = 0	-1 x 3 = - 3	1 x 3 = 3
TOTAL	—	0+1+0+0 =1	1+1+0+(-3)=-1	0+1+2+3=6

Conversely, the interrater process established an inverse relationship to Narrative immersion. This means that the tool will recommend that if learners are more experienced with the subject matter content, then the instructional context will be farther from uses of immersion that leverage narrative aspects more, which is to say, it will leverage narrative aspects less. For clarity, this could be expressed more concisely – if learners are less acquainted with the subject matter content, narrative and story would be recommended activities compared to challenge-based activities; and if learners are more familiar with the content, challenge-based tasks would be recommended over story and narrative explanations.

The responses to each item in the questionnaire, graded as a 1-5 Likert scale, are multiplied by their System, Narrative, and Challenge relationship values. For instance, if an instructor answers the four sample questions of Fig. 2 as 1, 1, 2, and 3, respectively, this is multiplied by the factors in that figure and will yield the results in Table II. In this example, the coordinates (System, Narrative, Challenge) are (1,-1,6).

The minimal results for each dimension occur if an instructor responds "5" to all questions with a "-1" factor, and "1" to all questions with a "1" factor. The maximal result occurs if an instructor responds "5" to all questions with a "1" factor and "1" to all questions with a "-1" factor. In the sample case of Fig. 2, this would mean the following ranges for the possible outcomes: System [1..5]; Narrative [-3..9]; Challenge [3..15]. In our tool, considering all questions and factors, actual ranges are mapped into a three-dimensional unit cube. Thus, these ranges are scaled to [0..1] in order to achieve coordinates within the immersion cube, using Equation 1. This enables the teaching/training context coordinates to be identified, using Equation 2.

$$Normalized\ immersion\ dimens. = \frac{Questionnaire\ immersion\ dimension}{max.\ dimension - min.\ dimension} \quad (1)$$

Teaching/Training Context = (Normalized System, Normalized Narrative, Normalized Challenge) (2)

Phase 2 from Fig. 1 initiates, "Ranking Uses by Proximity". The proximity of the Teaching/Training Context to each Educational Use is then simply a matter of calculating its Euclidean distance using Equation 3: "x", "y" and "z" represent the Normalized System, Narrative, and Challenge dimensions. The index "*ttc*" refers to the Teaching/Training Context coordinates from Equation 2, and the "*i*" index refers to each of the Beck et al.'s educational uses of immersive environments [26].

$$Euclidean\ distance = \sqrt{(x_{ttc} - x_i)^2 + (y_{ttc} - y_i)^2 + (z_{ttc} - z_i)^2} \quad (3)$$

Question	Minimum example (1)	Maximum example (5)	System	Narrative	Challenge
How much time do you have available to plan and create the activity?	I have one week available	I'm doing this with plenty of time, at least a semester's margin.	0	1	0
Do you want to plan an activity just to raise awareness or to learn in-depth?	I want students to acknowledge the value or learning the content	I want them to know how to use and apply the contents even in different or diverse areas.	1	1	1
For the learners, will it be a short or long activity?	Few sessions (lessons / hours etc.)	Plenty of time (projects, several weeks, etc.)	0	0	1
Do learners have a little or a lot of experience with the learning content?	They have never been in contact with the content	They are very experienced, and seek to complement their skills	0	-1	1

Fig. 2. Sample questionnaire items, with their relationship values to immersion dimensions.

The calculated distances are ranked, and the tool presents the ranked uses, highlighting the three closest ones to recommend as educational approaches (Fig. 3).

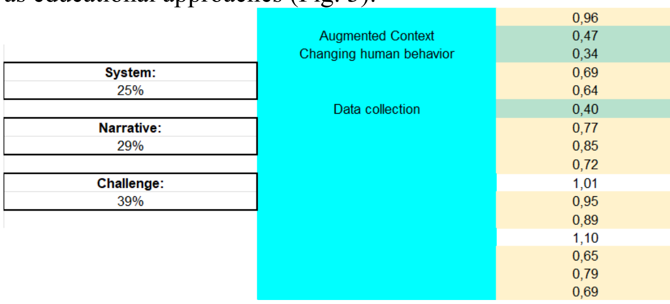

Fig. 3. Sample tool output, highlighting the closes ILEs use themes.

This leads into Phase 3 of Fig. 1, "Check Matrix of Examples for each Pedagogical Approach". As explained in section 2.3, while there are many educational theories and approaches, we have considered four main categories of approaches, which are commonly used in education and training contexts: Expository, Interrogative, Demonstrative, and Active.

Regarding the 16 uses of ILEs identified by Beck et al. [26], such as those visible in Fig. 4, we created a matrix that provided examples of how to apply each use within the four pedagogical methodologies. To facilitate understanding of the resultant learning activities, we used verbs distinguishing between teaching actions (plain verb) and learning actions ("quoted verb"). So, for each of the 16 uses of immersive learning environments, we created a matrix that provides an example of how to apply each use within each of these four educational approaches. We patterned this matrix after common presentations of Bloom's revised taxonomy [32] as a matrix of two dimensions, cognitive process vs. knowledge, with the cells of the matrix containing proposed action words: verbs (process) or objects (knowledge). We used Bloom's revised taxonomy as a template because just as with our work, it contains two dimensions with an actionable outcome. Also similarly, our matrix does not contain fully described examples but action words, as shown in Fig. 4. We used verbs, since these are meant to represent activities, but distinguished between teaching actions (plain verb) and learning actions ("quoted verb").

The current Web platform for this tool (https://immersivetraining.eu) enables the user to navigate these options, by presenting them in a plain text context: "I use immersive environments for <immersive learning use>, within an <methodology name> methodology to, for example, <action word>". For example, from Fig. 4, for Emphasis in an Expository methodology, this would be:

"*I use immersive environments for Emphasis, within an Expository methodology to, for example, Alert*"

Whereas for a Demonstrative methodology, this would yield:

"*I use immersive environments for Emphasis, within an Demonstrative methodology to, for example, Highlight*"

Figs. 5 and 6 present the current outlook of the Web prototype of this tool. The final phase 4 from Fig. 1 is for teachers to use the matrix to develop measurable objectives and plan their educational intervention. This would be supported by providing several specific examples in each cell, rather than just

16 Themes on accounts of use of immersive learning	Description	Methodology			
		Expository	Interrogative	Demonstrative	Active
Changing human behavior	The theme "Changing human behavior" represents accounts of use of immersive environments for learning activities designed to alter individuals' physical or attitudinal patterns toward themselves, others, or in response to a specific stimulus.	Explain	"Reflect"	Evidence Emphasize	"Train"
Data collection	The theme "Data collection" represents accounts of use of immersive environments for learning activities that collect data from the users. This includes data that users actively harvest from their location and data about the users themselves.	Describe	"Inquire"	Indicate	"Use"
Emotional and cultural experiences	The theme "Emotional and cultural experiences" represents accounts of use of immersive environments for learning activities where non-physical concepts are experienced within context. This includes social, societal and historical situations, but also metacognitive awareness such as one's emotional responses or dangerous situations.	Define Relate	"Analyze"	Illustrate	"Simulate"
Emphasis	The theme "Emphasis" represents accounts of use of immersive environments for learning activities to draw the attention of the participants by various means, which may or may not include extra information.	Alert	"Discriminate"	Highlight	"Experience"

Fig. 4. Sample recommendation matrix items, with action words for teaching/learning.

the action words. Teacher thus could select from that list in developing a lesson plan.

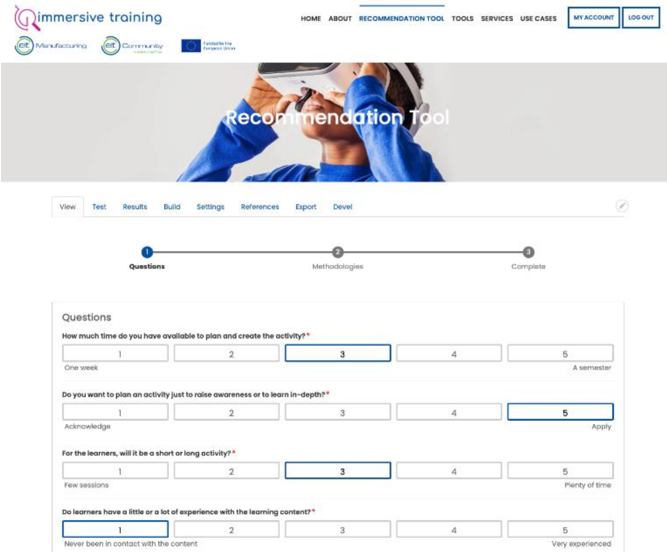

Fig. 5. Current outlook of the web prototype of the recommendation tool.

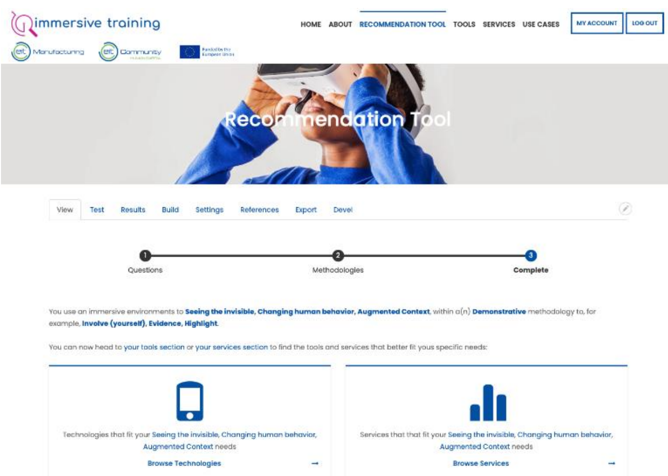

Fig. 6. Sample output of current web prototype of the recommendation tool.

V. Discussion and Limitations

The three stages of the tool provide a response to Mishra & Koehler's [10] 'wicked problem' of technology integration, applied to immersive learning environments. The stages emerge from the shortcomings of current models described in section two, by considering constraints and goals as a starting point, thus ascertaining the instructor's current context, and recommending based on those constraints and goals. The recommendations, rather than dictating educational approaches, assume no particular educational approach as optimal, and thus situates the instructional context within the panorama of known alternatives for educational uses of immersive learning environments. Thus, the instructor considering pursuing one particular type of use is aware that for each use there are accounts available in the literature, serving as inspiration or providing insights. Conversely, the instructor can innovate, pursuing an entirely novel direction, to explore its feasibility and potential, but be aware of taking that stance and allowing for extra time to pursue such an endeavor. This approach acknowledges the instructor as both pedagogical and local context expert, and relies on their knowledge of those areas to select the right approach to fit their specific pedagogical preferences and local context. Thus, this tool is innovative in that it provides a context-based way for instructors to select approaches for educational use of immersive learning environments, hopefully contributing to better educational plans and activities.

However, there are several assumptions embedded in this tool that require further research, for validation and refining. First and foremost, the testing scenarios mentioned in the methodology section are only preliminary. Thus, extended testing is required to determine the quality of the recommendation, e.g., whether the instructors find the recommendations adequate to their context of resources and goals. Another limitation lies in the action words provided as examples in the matrix: there are many forms of application of a given use within an educational approach. Suggesting that Emphasis for Demonstrative methodologies is limited to Highlighting is but a glimpse of the variety of ways in which that use could be employed, and more diversity is needed. Also, the way in which the educational context is determined and mapped needs wider validation: the coverage by the questions of the panorama of constraints and goals needs to be evaluated, and the adequacy of the questions themselves for that purpose as well. For example, we need to validate the questionnaire with instructors from a wide range of professional and educational contexts and seek feedback on additional questions to add. The relationship of the questions to the dimensions of immersion is yet another item for further validation, as is the ranking of alternatives: perhaps Euclidean distance is too plain a method to rank the uses for further consideration. In other words, we need to broaden the diversity and number of experts used in this validation process in order to increase the quality of the relationship of the questions to the dimensions of immersion.

Finally, the basis for the recommendation is currently not research results on educational outcomes of the uses, about which simply there is not enough knowledge available in the literature [26]. Rather, we are assuming a combination of two things: that existence of accounts of a given use is indication of some feasibility for it, and that it is also an indication that the instructor can expect to find examples in the literature from which to draw insights and inspiration. This shortcoming is currently insurmountable, but one should reasonably expect that as the body of literature on immersive learning environments grows, reliable outcome measures become available, and should then be included in recommendation tools such as this one. The Knowledge Tree [33] initiative, authored by the Immersive Learning Research Network, is a promising example of an effort `to systematize the field of immersive learning, which would combine both scholarly and practical knowledge and create an ever-growing knowledge base of research-based accounts of specific uses of immersive learning.

VI. Conclusions and Final Thoughts

The Immersive Training Platform is found at https://immersivetraining.eu. It was designed as part of the RedVile activity of the Cross-KIC Human Capital project at EIT

Manufacturing, one of the innovation communities of the European Institute of Innovation and Technology (EIT). The RedVile activity aims to support innovation in education using virtual reality, leveraging knowledge and evidence on the use of immersive technologies in education and training. This online tool aims to fulfill one of its stated goals, provide implementation and use case recommendations based on an assessment of instructional needs and context.

The tools and methods provided are a novel approach to the dilemmas of integrating technology in instruction. We leveraged the existence of a recent survey on educational uses of immersive learning environments to situate the instructor amidst a context of resources and objectives, thus recommending educational uses aligned with that context, based on actual accounts found in the literature. The resulting matrix enables instructors in any context to perform educational planning decisions more aware of their feasibility and innovative potential.

Given the multiple limitations presented in the previous section, significant research is needed to validate this tool, but it shows promise as an approach to support instructors in their educational planning. Future research should seek to test and refine the tool with large numbers of instructors, learning designers, and educational researchers, across the various limitations: the phrasing of the questions, the coverage of different constraints and goals, the adequacy of the examples for the educational approaches, and the way that the context is matched to the known uses to provide recommendations.

Should results confirm the adequacy of this approach, the refined tool should be integrated with specific standards for primary, secondary, vocational, professional, and higher education in various content areas in different nations. Doing this would further improve its recommendation value and ensure that instructors are adequately addressing the standards for each age level and content area and would greatly support educational planning. Ultimately, the knowledge emerging from the development and application of this tool may result in the development of a technology integration model for teachers to use immersive learning environments, empowering their greater adoption and better learning.

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