

Immersive Learning Research From the Perspective of Its Researchers and Practitioners: Questionnaire Validation and Early Results From a Survey on a Conceptual Framework for the Field

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Abstract. Immersive learning research is a field of study that emphasizes diversity of scholarship and subject areas. This diversity presents a challenge for understanding the breadth and depth of the field of immersive learning, a challenge that led to the Immersive Learning Research Network's call for the community of immersive learning researchers to develop a conceptual framework supporting a common understanding of this diverse field - The Immersive Learning Knowledge Tree. However, this structure has not had its underlying assumptions validated by the larger, diverse community of immersive learning researchers and practitioners. Thus, we developed, validated, and disseminated across associations of the field a questionnaire for analyzing the assumptions, structure, and relevance of the Knowledge Tree proposal. Early results point towards overwhelming agreement from the community on the premise that the field of immersive learning research is muddled/fragmented, the current knowledge partially disjointed, specifically among different disciplines (Q3), due to its interdisciplinary nature. There are also strong indications supporting the premise that researchers active in the field of immersive learning research desire to combine their efforts with others.

Keywords: Survey, Questionnaire, Immersive Learning, Knowledge Tree, iLRN.

1 Introduction

The immersive learning research field of study emphasizes diversity of scholarship. Researchers hail from traditional academics and from private industry; they also orig-

inate from a veritable cornucopia of subject areas, including (but not limited to): Educational technology, computer science, game design, learning sciences, psychology, biomedical sciences, narrative studies, arts, design, media studies, communication sciences, and the multitude of disciplinary and occupational content areas wherein immersive learning and training may be relevant. Each researcher approaches their study of immersive learning with a unique combination of knowledge development, assumptions, theories, practices, and methodological means. This diversity is, indeed, a strength of the field as the overall spectrum of research is less likely to find itself dwelling on a small number of definitions or lenses for interpreting data. However, it may be likewise a weakness, as it presents a challenge for understanding the breadth and depth of the field of immersive learning. Beyond field-specific preferences for how to do qualitative and quantitative research, differences include distinct definitions of “immersion”, “learning”, and “environment”, or varying methods in accomplishing literature reviews and meta-analyses. This has been discussed in the Immersive Learning Research Network (iLRN) community for several years, most notably by Jonathon Richter in his paper about the Immersive Learning Quadrivium [1]. Building on this, iLRN launched a call for the community of immersive learning researchers for the development of a conceptual framework supporting a common understanding of this diverse field - The Immersive Learning Knowledge Tree initiative [2].

The Immersive Learning Knowledge Tree (ILKT) conceptual framework is based on a few premises its proponents consider essential (*ibid.*). First, the premise of the importance of developing a common language. Confusion and frustration ensue if the individuals in a room only speak and write different languages. Unfortunately, similar conditions often exist when groups of immersive learning researchers meet at conferences or regional meetings, because they are speaking different “languages”, as shown in a recent analysis of the thin theoretical grounding of recent surveys in the field [3]. Second, the premise of the importance of not only using similar terminology as other researchers, but also having a deep understanding of how the methods researchers utilize in their own research are similar or different from those used by others. Some similar methodologies used in the field go by completely different names, while others use similar names but vary widely in their specifics of application. The third and final premise of the ILKT conceptual framework is the importance of advancing the use of common theoretical approaches and models. The stated rationale for this is to enable researchers to do better work by building their research upon the work of others and not simply attempting to do the same research that has already been accomplished by others with whom they are not familiar. The ILKT proposal contends that the current state of adoption of these three premises in the field of immersive learning is “muddled, the current knowledge partially disjointed, specifically among different disciplines” [2].

The ILKT’s several premises may or may not be consensual among the community of immersive learning researchers and practitioners. We sought to analyze their validity, conducting a questionnaire-based survey of the community. This paper presents that questionnaire’s validation and early survey outcomes. It is structured as follows: background and related work, questionnaire development and validation, application

of the questionnaire, analysis of early results, and conclusions regarding the validation of the ILKT conceptual framework.

2 Background and Related Work

2.1 The Concept of Immersive Learning

The field of immersive learning is faced with a paradox of terminology differences. It is understood as the process of employing immersion as “a theoretical lens to analyze, interpret, and shape” the context of learning and teaching [3]. However, the clarity of that depends on how researchers interpret “immersion” as a theoretical lens. The terms “immersion” and “immersive” are used so widely that literature surveys often do not cite a definition or employ very distinct meanings (ibid.). Technology-based researchers often consider Murray’s intuitive “sensation of being surrounded by a completely other reality” [4], Slater’s perspective of immersion as a quality of technology [5] or Witmer & Singer’s view of immersion as a subjective user experience [6]. Researchers in other fields, such as psychology, literature studies, the arts, etc., view it from perspectives of narrative, engagement, and psychological flow [7]. An example of this is Agrawal et al.’s proposal [8, p. 6] of an objective, interdisciplinary definition of immersion from the literature: “a phenomenon experienced by an individual when (...) in a state of deep mental involvement in which (...) cognitive processes (...) cause a shift in (...) attentional state such that one may experience disassociation from the awareness of the physical world.” A second example would be Nilsson et al.’s framework of breaking down the perspective into three aspects: system, narrative, and challenge [7]. Such a framework enables clear interpretation of an immersive learning experience as the phenomenon emerging from the conceptual interconnection of system, narrative, and challenge aspects of immersion. System immersion reflects Slater’s or Murray’s perspective, Narrative immersion reflects mental absorption with a story and its characters, and Challenge immersion reflects mental absorption dealing with agency: tasks, problems, activities. Unfortunately, the use of this or other broader, interdisciplinary conceptual tools is not commonplace. Consequently, literature reviews are hard to compare/contrast, and outcomes research is prey to misunderstandings, or other ontological inconsistencies: a fragmentation of the field of immersive learning research, isolated and blunted in impact.

2.2 The Immersive Learning Knowledge Tree

The Immersive Learning Knowledge Tree conceptual framework (ILKT) is an iLRN initiative endorsed by the IEEE Education Society Technical Committee on Immersive Learning Environments (TC-ILE). It was launched as an appeal to the community of immersive learning researchers and practitioners to achieve better conceptual understanding and developed solid bases for cooperation and engagement. To communicate intuitively, iLRN adopted the metaphor of a tree, grounded in soil by its roots, growing into leaves and populated by birds [2]. The roots of the ILKT are common definitions, methods, and research instruments. Just as roots hold the soil

together and protect from erosion, so also do common definitions, methods, and instruments provide stability to the “soil”, composed of elements such as ontologies, taxonomies, and conceptual data models. Together, the roots and the soil set the stage for the growth of the trunk of the tree: the structural knowledge of the field of immersive learning. This comprises things like scoping reviews and systematic literature reviews; classified collections of facts, like expert input from the field of immersive learning (e.g., the iLRN State of XR and Immersive Learning Report) and evidence repositories; and the awareness of the networked knowledge of the community researching and applying immersive learning, provided by Scientometrics and other network mapping instruments.

The structural knowledge trunk sprouts initiatives and knowledge towards outcomes. These are branches sprouting from the trunk: fields of inquiry and intertwined research priorities/agendas. The outcomes shooting from the branches are leaves, such as exemplars (e.g., practitioner accounts, usage cases), instruments (e.g., templates for practice and research), and tools. Birds represent the community of immersive learning researchers and practitioners, employing these leaves in their work, creating, combining efforts, e.g., “crowdsourcing efforts like tagging and reporting” [2].

3 Validation of the ILKT Conceptual Framework

3.1 Research questions and questionnaire development

While the informed argument for the ILKT is compelling [2] it lacks any confirmation of whether the community of immersive learning researchers and practitioners acknowledges its assumptions. Thus, our analysis of those assumptions is targeting this community. Also, we seek to evaluate the structure of the framework itself, determining the community’s views on the relevance of its elements. Finally, we seek to identify other aspects of the status of the field which may be relevant for the ILKT framework.

From the above rationale, our research questions were as follows:

RQ1. How do the assumptions of the ILKT align with the community of immersive learning researchers and practitioners?

RQ2. What are the community of immersive learning researchers and practitioners’ views on the structure of the ILKT’s framework and its elements?

RQ3. What other aspects of the field of immersive learning are relevant for the ILKT framework?

We are addressing these RQs via a survey, based on a questionnaire. To develop the questionnaire, we employed empirical data [9], by analyzing the exact phrasings of the arguments published in the seminal ILKT paper [2], and identifying their assumptions. Each assumption was rendered as a statement following the phrasing published in that paper. For each assumption we created a matching question. When assumptions were presented as fact, we asked for agreement positioning (Strongly Disagree-Strongly Agree) using 5-point Likert scales, e.g. “The field of ‘immersive

learning research' is muddled/fragmented due to its interdisciplinary nature.” When assumptions employed intensity, we asked for viewpoints on level. For instance, “How strong do you find the theoretical grounding for the field of immersive learning research?” from “Very Weak” to “Very Strong”. All these questions were followed by open-ended question items for respondents to explain their viewpoints, to attain better qualification of the evaluations. The final items in the assumptions were the actual phrasing of the ILKT proposal, presented as an idea, questioning its relevance, and asking for viewpoint explanation: “A conceptual framework for building a common and agreed understanding as well as for mapping knowledge, tools and services in the field of immersive learning research, combining both scholarly and practical knowledge.”

To evaluate the ILKT structure, we also extracted from its paper the phrasing of the ILKT stated components, organized as categories, which were also as phrased in the paper itself (“research sources”, “disciplinary and interdisciplinary areas and processes”, “practical knowledge sources”, “community participation and application”). For each component in each category, we created a matching question, and included an open-ended question item in each category for respondents to suggest other relevant components.

Finally, to minimize agreement bias, we did not provide the respondents with a link to the ILKT paper, nor did we employ either the term “Knowledge Tree” or its metaphors (roots, soil, trunk, branches, leaves, birds). Instead, only the actual assumptions and components were employed in the questions.

3.2 Questionnaire validation

The tentative questionnaire was subjected to expert review [9], for which we sought out experts in immersive learning. We did this in two iterative cycles. In iteration 1, we sent the questionnaire to the boards of the two immersive learning research and practice organizations associated with the ILKT proposal: IEEE TC-ILE and iLRN, comprising a total of 14 different experts (paper authors not included). We received qualitative feedback via email as well as trial responses from six experts.

Feedback centered around issues related to navigation, data privacy, grammar, and interpretation of questions. Navigational feedback recommended adding a back button on each page of the survey, not requiring participants to answer all questions on a page to move to the next survey page, adding a progress bar, and flow between questions and sections. Data privacy feedback suggested including further statements on how the data would/would not be used and disposed of. Interpretation-related recommendations focused on proper grammar, the meaning of specific terminology, and cases where certain items should be split into multiple questions for clarity.

Trial responses were analyzed for consistency between Likert scale questions and the associated open text explanations. Some cases were identified where the open text responses revealed that the respondents had interpreted the question differently from its intent, thus revealing ambiguity or equivocal aspects that were corrected. One example was the phrasing “struggle to combine their efforts with others”. This phrasing had trial responses on the Likert scale disagreeing with the existence of “struggle

to combine”, explained in the open text responses that researchers wanted to combine efforts, but had difficulty comparing them due to differences in terminology or conceptual models. This led us to divide the question into two, addressing both aspects: one inquiring about the desire to cooperate with others, and the original one changing in phrasing into “struggle to compare/contrast efforts with others”.

During iteration 2 we again sent the questionnaire to the 8 experts from the TC-ILE and iLRN boards who had not replied with feedback during the first iteration, plus an author of the original ILKT proposal who is not a member of either board. We received 1 qualitative feedback via email and trial responses from 6 experts. Mostly, responses were consistent between Likert scale and open text questions, pointing towards adequacy of the survey instrument. There was a single conceptual misunderstanding: an incorrect interpretation of theoretical grounding as meaning, “grounded in data.” As a result, we rephrased it to read, “theoretical background”. The remaining feedback was a clarification for the informed consent and proposed additions to options of the ILKT framework elements. These were: clarifying “classified collections of facts” as “classified collections of facts and/or research results”; adding “review of reviews” to the same question as an option; adding “Metaphors and models for expressing interdisciplinary connections between areas” to the “Disciplinary and interdisciplinary areas and processes” as a question option; and rephrasing “community participation and application” as “community participation methods” and altering wording of one of the question options to emphasize analysis as a process.

3.3 Final questionnaire

The validated questionnaire is included in the appendix, and its structure is presented as a scheme in Fig. 1. It is structured as follows: the first part of the questionnaire (topic T0, questions Q1-Q2) presents the purpose of the study and provides the informed consent form; the rest of the questionnaire covers topics T1 through T5. These are:

T1: The need for the conceptual framework

T2: The theory, methods, and collaboration in the field

T3: Framework structure

T4: Demographics

T5: Interview request

The questions under topics T1 and T2 address RQ1 (“How do the assumptions of the ILKT align with the community of immersive learning researchers and practitioners?”). The questions under topic T3 address RQ2 (“What are the community of immersive learning researchers and practitioners’ views on the structure of the ILKT’s framework and its elements?”). In T3 questions, we included open-ended question items labeled as “Others (please specify)” to Q23-Q26, which enabled us to address RQ3 (“What other aspects of the field of immersive learning are relevant for the ILKT framework?”).

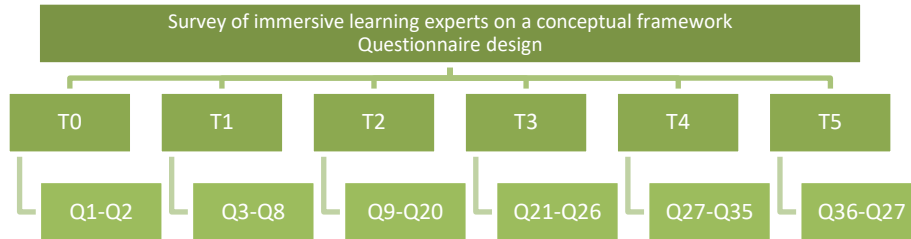


Fig. 1. Questionnaire structure.

In topic T1, we asked respondents to evaluate assumptions about the need for the ILKT framework on a five-point scale: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5).

The first addressed premise was:

Q3: The perspective of the field of ‘immersive learning research’ status is muddled/fragmented, the current knowledge partially disjointed, specifically among different disciplines.

Respondents which agreed or strongly agreed with this assumption were presented with follow-up questions on its three different aspects, Q4-Q6, shown below. All other respondents would be directed to question Q7.

Q4: The field of ‘immersive learning research’ is muddled/fragmented due to its interdisciplinary nature.

Q5 Other: the field of immersive learning research is muddled/fragmented for a different reason. (open-ended answer)

Q6: Researchers who are working in the field of immersive learning research desire to combine their efforts with others.

The second addressed premise was:

Q7: Researchers struggle to compare/contrast efforts with others from different fields of activity within immersive learning.

Respondents which agreed or strongly agreed with this assumption were presented with the follow-up question Q8, shown below. All other respondents would be directed to the following topic (T2, question Q9).

Q8: Please explain your point of view (open-ended answer)

In topic T2, we asked respondents to evaluate each assumption of the ILKT framework on the strength of theories and definitions in the field of immersive learning on a five-point scale for Q9, Q11, and Q13: Very Weak (1), Weak (2), Neither Weak nor Strong (3), Strong (4), Very Strong (5). We also asked for the reasons behind those evaluations (Q10, Q12, Q14).

Q9: How strong do you find the theoretical background for the field of immersive learning research?

Q10: Please indicate the reasons for such a status of theoretical background.

Q11: How strong do you find the consensus on the definition of immersion?

Q12: Please explain your point of view.

Q13: How strong do you find the consensus on the definition of learning?

Q14: Please explain your point of view.

Also, within topic T2, we then addressed assumptions of the ILKT framework on the strength of collaboration and methods in the field of immersive learning, by providing a range of possibilities from 0 to 10 (Q15, Q17, Q19), with follow-up open-ended questions asking for the reasons for those assessments (Q16, Q18, Q20)

Q15: On a scale of 0 to 10, how strong is collaboration across the disciplines in the field of immersive learning research:

Q16: Please explain your point of view.

Q17: On a scale of 0 to 10, how strong are methods used to analyze immersion in the field of immersive learning research:

Q18: Please explain your point of view.

Q19: On a scale of 0 to 10, how strong are methods used to analyze learning in the field of immersive learning research:

Q20: Please explain your point of view.

Within topic T3, related to the community's view on the structure of the ILKT framework, we first address the relevance of the framework itself on a five-point scale (Irrelevant, Slightly Relevant, Moderately Relevant, Relevant, Very Relevant) and then provided an open-ended follow-up question:

Q21: A conceptual framework for building a common and agreed understanding as well as for mapping knowledge, tools, and services in the field of immersive learning research, combining both scholarly and practical knowledge.

Q22: Please explain your point of view.

We then address the relevance of each of the framework's components, using the same range of possibilities: the research sources (Q23), the disciplinary and interdisciplinary areas and processes (Q24), the practical knowledge sources (Q25), and the community participation methods (Q26). For each, an open-ended option "Others (please specify)" was included. The various options for these questions are provided in the appendix.

Q23: Please evaluate the relevance of the following research sources for the proposed framework.

Q24: Please evaluate the relevance of the following disciplinary and interdisciplinary areas and processes for the proposed framework.

Q25: Please evaluate the relevance of the following practical knowledge sources for the proposed framework.

Q26: Please evaluate the relevance of the following community participation methods for the proposed framework.

Topic T4 (Q27-Q35) surveyed the respondents' personal context and information, including their personal perspective in the research-practice continuum (five options), years of experience in the field doing research (seven options) and practice (seven options), their field of activity (27 options), country, age (eight classes), gender (six classes), academic qualifications (six options), and professional affiliations (17 options).

Topic 5 inquired on respondents' availability for a follow-up interview (Q36, Yes/No answer options) and on whether to receive the results of the survey (Q37 Yes/No answer options, plus Q38 email field for 'yes' responses).

4 Data Collection Procedures

4.1 Survey process

We selected a wide range of researcher and practitioner organizations whose members may be working in the field of immersive learning (see Table 1). We first created a potential list from our own contacts and professional networks, and then presented the resulting list to colleagues on the iLRN and IEEE EdSoc TC-ILE boards, updating the list from their inputs. We then e-mailed each organization stating the purpose of our questionnaire and why we thought that their organization might have some members who worked in immersive learning, asking them to consider distributing the questionnaire link to their membership. For example, we sent an e-mail to the Association for Educational Computing & Technology (AECT) suggesting that the purpose of our questionnaire tightly aligned with their mission of providing, "international leadership by promoting scholarship and best practices in the creation, use, and management of technologies for effective teaching and learning." Initially, 29 organizations from Table 1 were contacted and asked to distribute the survey. Two of these organizations responded positively, with iLRN and IEEE EdSoc TC-ILE agreeing to distribute our questionnaire. We also sent out two subsequent reminders to these organizations, requesting for a reminder to be distributed to their members. Further, we spread the questionnaire to individual researchers we had identified as having publicly contributed to past iLRN conferences in an earlier survey [9], also asking for subsequent dissemination to other researchers. A total of 47 participants have completed the survey.

4.2 Respondents

Of the 47 respondents, women comprised 27%, 70% were men, and 3% preferred not to answer. They were mostly 45-64 years old (57%), with age classes represented from 26-34 to 75-84. Their qualifications were essentially at doctoral level (81%), with some representation at master level (14%) or short-cycle tertiary (5%). Geographically, roughly a third stemmed from the USA (34%), followed by Portugal (9%), and the UK and Greece (9% each), Norway and Romania (6%), and other countries (3% each): Austria, Brazil, Canada, Colombia, Estonia, Israel, Japan, New Zealand, and Pakistan. They mainly listed their fields of activity as Multidisciplinary (32%) and Computer Science (30%), followed by Social Sciences and Engineering

(14% each), with lower participation of other fields (3% each): Arts and Humanities, Environmental Science, Mathematics, and Medicine. Mostly, they described their perspective in the Research-Practice continuum as Balanced (50%), with contributions from Mostly Practice and Mostly Research (22% each), and Research (6%). Respondents participated in multiple professional organizations each, most mentioned being iLRN (26%), then EATEL (10%), iED (8%), VRARA (7%), AACE (6%), EDEN (6%), IEEE Education Society (5%), IEEE EdSoc TC-ILE (4%), OLC (4%), AECT (3%), ISTE (3%), Games for Change (3%), DiGRA (2%), and SEGAN (2%). Others (8%) were mentioned (one mention each): ACM, AERA, AREA, ASEE, CEC, CSEDU, Gesellschaft für Informatik, IEEE TALE, ISI, LORNET, and SCMS.

In terms of experience, the largest class was that of 3-5 years of experience in the field (42%), followed by 11-15 years of experience (17%), then 1-2 years (11%), and 6-10 year of experience, over 20 years of experience, or no experience (each 8%). With less participation we had the class with 16-20 years of experience (6%).

Table 1. List of organizations to whom we sent the questionnaire.

Organizations
Academy of International Extended Reality
Association for the Advancement of Computing in Education (AACE)
Association for Educational Computing & Technology (AECT)
Consortium for School Networking (CoSN)
Creative Science Foundation (CSf)
Digital Games Research Association (DIGRA)
Ecocity Builders
Educators in VR
EDUCAUSE
eLearning Guild
European Association of Technology-Enhanced Learning (EATEL)
European Distance and E-learning Network (EDEN)
European Edtech Alliance
Games for Change
IEEE EdSoc TC-ILE
IEEE Education Society
Immersive Education Initiative (iED)
Immersive Learning Research Network (iLRN)
Institute for Learning Innovation
International Game Developers Association (IGDA)
International Society for Technology in Education (ISTE)
Online Learning Consortium (OLC)
Serious Games Network (SEGAN)
Serious Play Conference
VR/AR Association
VRDays
XR Association (XRA)
IEEE ICICLE
AGORA - EIT Manufacturing

5 Preliminary Results

As the questionnaire includes Likert scale items and open-ended questions, we combine qualitative and quantitative analysis. 28 Likert scale-based items have been answered completely by 38 respondents. The evaluation of the Cronbach's Alpha coefficient [10] is 0.77. It reveals a relatively high internal consistency reliability, meaning that response values for each participant across the questionnaire set of questions are consistent, and the developed questionnaire is acceptable for applied scenarios. Table 2 gives an overview about respondents' average opinion (mean values) and discrepancies (standard deviation) of the Likert scale items, with the notation "Q_x_y" denoting sub-question y of question x (for instance in Q23, there is a different response for each research source). A notable high disagreement "(!!)" can be found for the group of items Q15, Q17 and Q19, but also items Q4, Q13, Q23_7, Q24_1 and Q25_1 exceed the standard deviation "(!)" of the other items. While questions Q21-Q26 are not discussed further, their mean values and standard deviations are presented in Table 2 as they are part of the overall internal consistency reliability.

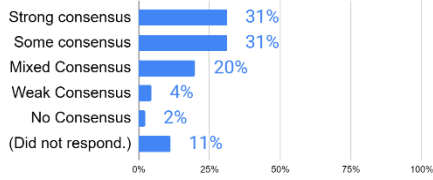
Table 2. Mean values and standard deviations of the Likert scale items.

Item	Mean	Std. Dev.	Item	Mean	Std. Dev.
Q3	3.93	0.759	Q23_4	3.92	0.818
Q4	3.69	1.022(!)	Q23_5	3.92	0.85
Q6	4.12	0.88	Q23_6	3.95	0.941
Q7	3.66	0.938	Q23_7	3.30	1.077(!)
Q9	3.22	0.962	Q23_8	4.05	0.911
Q11	3.33	0.982	Q24_1	3.80	1.095(!)
Q13	3.95	1.011(!)	Q24_2	4.17	0.845
Q15	5.95	2.253(!!)	Q24_3	3.75	0.806
Q17	5.40	2.158(!!)	Q25_1	3.78	1.017(!)
Q19	6.32	2.069(!!)	Q25_2	3.00	0
Q21	4.11	0.894	Q25_3	4.39	0.766
Q23_1	4.34	0.669	Q25_4	4.56	0.652
Q23_2	4.32	0.739	Q26_1	4.42	0.692
Q23_3	4.05	0.868	Q26_2	4.39	0.728

Respondents provided information on RQ1 (assumptions of the ILKT), on RQ2 (relevance of the ILKT framework and its components) and on RQ3 (other aspects potentially relevant for the ILKT framework). Questionnaire items based on 5-point Likert ratings were analyzed quantitatively. Open response items were subjected to thematic analysis [11]. Here we provide preliminary results for RQ1 in Table 3.

Table 3. Preliminary survey results on RQ1

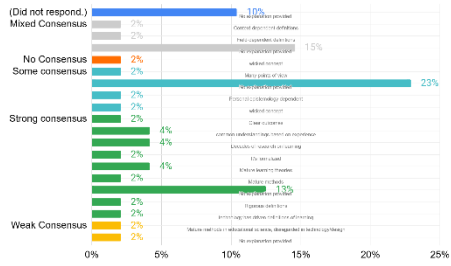
Item	Preliminary Result
<p>Strongly agree 20%</p> <p>Agree 56%</p> <p>Neither agree nor disagree 18%</p> <p>Disagree 4%</p> <p>Strongly disagree 0%</p> <p>(Did not respond.) 2%</p>	<p>Q3: The perspective of the field of ‘immersive learning research’ status is muddled/fragmented, the current knowledge partially disjointed, specifically among different disciplines.</p> <p><i>Most respondents (76%) strongly/agree with this aspect.</i></p>
<p>Strongly agree 17.1%</p> <p>Agree 54.3%</p> <p>Neither agree nor disagree 11.4%</p> <p>Disagree 14.3%</p> <p>Strongly disagree 2.9%</p>	<p>Q4: The field of ‘immersive learning research’ is muddled/fragmented due to its interdisciplinary nature.</p> <p><i>Of those that agreed with the previous question, most respondents (71%) strongly/agreed with this aspect.</i></p>
<p>diversity of the phenomenon itself (locale, tools) 13%</p> <p>Lack of common institutional policies 19%</p> <p>lack of common methods 13%</p> <p>lack of exposure to research in other fields 25%</p> <p>lack of ontological structure 25%</p> <p>lack of systematic analysis of a problem 6%</p> <p>(Sum is not 100 due to rounding errors.)</p>	<p>Q5: Other: the field of immersive learning research is muddled/fragmented for a different reason.</p> <p><i>Thematic analysis of open-ended answers showed that the most prevalent reasons (25% each) were the lack of exposure to research in other fields and the lack of ontological structure in the field. 19% considered either lack of common institutional policies, while 13% mentioned either the diversity of the phenomenon itself (locale, tools) or lack of common methods. Also mentioned (6%) was the lack of a systematic analysis of a problem.</i></p>
<p>Strongly agree 26%</p> <p>Agree 35%</p> <p>Neither agree nor disagree 11%</p> <p>Disagree 0%</p> <p>Strongly disagree 2%</p>	<p>Q6: Researchers who are working in the field of immersive learning research desire to combine their efforts with others.</p> <p><i>Of those that agreed with Q3, the majority of respondents (61%) strongly/agree with this aspect. 11% neither agree or disagree, and 2% strongly/disagree.</i></p>
<p>Strongly agree 11%</p> <p>Agree 40%</p> <p>Neither Agree nor Disagree 11%</p> <p>Disagree 13%</p> <p>Strongly disagree 0%</p> <p>Did not respond 26%</p> <p>(Sum is not 100 due to rounding errors.)</p>	<p>Q7: Researchers struggle to compare/contrast efforts with others from different fields of activity within immersive learning.</p> <p><i>Most respondents (51%) strongly/agreed with this aspect. 11% neither agreed or disagreed, and 13% strongly/disagree.</i></p>



Q13: How strong do you find the consensus on the definition of learning?

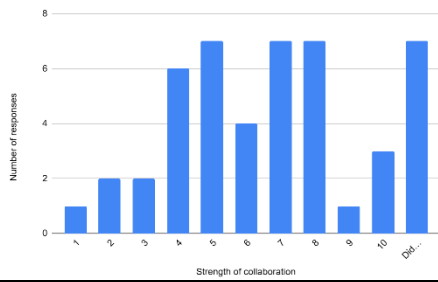
Most respondents (62%) found consensus to be strong/some. Only 6% found consensus to be weak or none.

(Sum is not 100 due to rounding errors.)



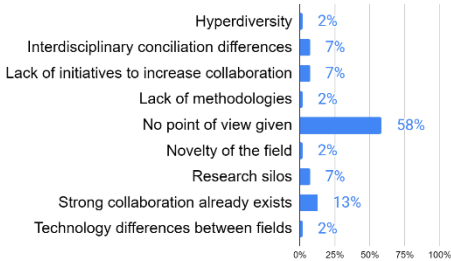
Q14: Please explain your point of view

Thematic analysis showed 53% of respondents did not explain their point of view on Q14. Major reasons given for strong consensus were 'common understandings based on experience', 'decades of research on learning', and 'mature learning theories' all at 4%. The single reason given for weak consensus (2%) was 'mature methods in educational science, disregarded in technology/design'.



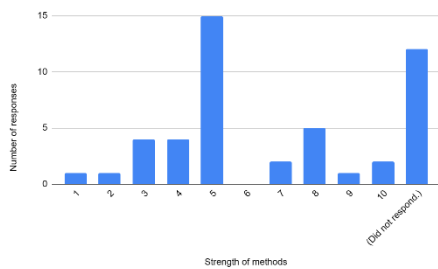
Q15: On a scale of 0 to 10, how strong is collaboration across the disciplines in the field of immersive learning research:

Some respondents (11) rated collaboration across the disciplines as an 8, 9, or 10. More rated it as a 5, 6, or 7 (18). Some respondents rated it as a 1, 2, 3, or 4 (10).



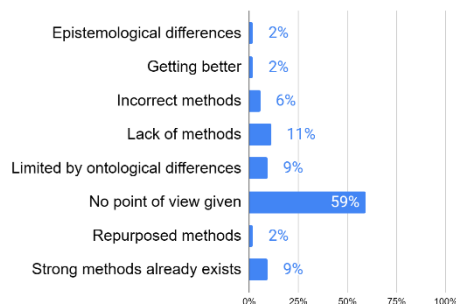
Q16: Please explain your point of view.

Thematic analysis showed that 58% of respondents did not explain their point of view on Q15. 13% said that it was strong because strong collaboration already exists in the field of immersive learning.



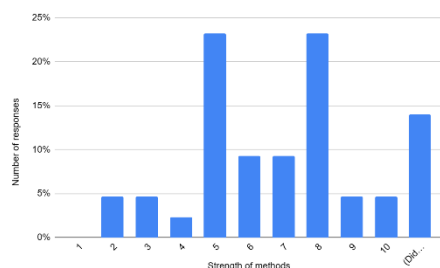
Q17: On a scale of 0 to 10, how strong are methods used to analyze immersion in the field of immersive learning research:

The most common response was 5 (15 responses) with 10 responses below and 10 responses above.



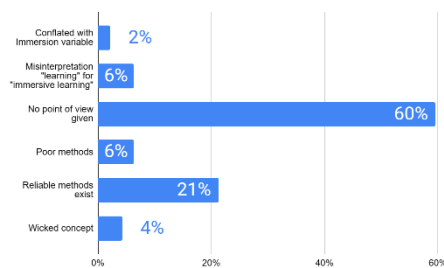
Q18: Please explain your point of view.

Thematic analysis showed that 59% of respondents did not explain their point of view on Q17. 9% indicated that methods used to analyze immersion are strong because 'strong methods already exist' and 2% because the field of immersive learning has repurposed methods from other fields. The rest of the respondents disagreed, stating their reasons that methods used to analyze immersion are weak or mixed due to ontological differences (9%), incorrect methods or 'getting better' (8%), and epistemological differences (2%).



Q19: On a scale of 0 to 10, how strong are methods used to analyze learning in the field of immersive learning research:

Strengths 5 and 8 stood out with 23% of responses each. At a second tier, responses 6 & 7 combined 19% of responses. Below 5 there were 12%, and above 8, 9% of responses.



Q20: Please explain your point of view.

No point of view was given by 60% of respondents. The prevalent reason was the existence of reliable methods (21%), with 6% disagreeing and referring poor methods. 6% misinterpreted 'learning' for 'immersive learning', 4% referred its nature of wicked concept, and 2% mentioned conflating with the immersion variable.

6 Discussion

As put forward in section III.C, the questions under topics T1 and T2 address RQ1, "How do the assumptions of the ILKT align with the community of immersive learning researchers and practitioners?". These are Q3.Q20, with early results presented in Table III. The questions addressing RQ2 and RQ3 are still under analysis. These are early results because the responses are still being tallied.

The early results point towards overwhelming agreement from the community on the premise that the field of immersive learning research is muddled/fragmented, the current knowledge partially disjointed, specifically among different disciplines (Q3), due to its interdisciplinary nature (Q4). There are also strong indications supporting the premise that researchers who are working in the field of immersive learning re-

search desire to combine their efforts with others (Q6) but that the struggle to compare/contrast efforts with others from different fields of activity (Q7).

The strength of the theoretical background for the field presented responses centered around the middle point (Q9), while there were indications of consensus on the definition of immersion (Q11) and learning (Q13). Methods for analyzing immersion seem to be average in strength (Q17), while methods to analyze learning are seen in a somewhat stronger status (Q18). The strength of current collaboration seems to point towards above average (Q15), but with a dispersion of responses.

7 Conclusions

The questionnaire validation results support its applicability. The early results of the survey indicate that the assumptions of the ILKT align with the community of immersive learning researchers and practitioners, by supporting several premises. Firstly, the field of immersive learning research is muddled/fragmented due to its interdisciplinary nature, with large majorities of subjects responding “Agree” or “Strongly Agree”. Secondly, there is the desire of the immersive learning research community to collaborate but struggling to compare or contrast results.

The questions regarding the theoretical background point towards some development but also struggle since a tendency for consensus on definitions is perplexingly combined with lack of strength on methods for their analysis.

We acknowledge the limitations of this study. The small number of respondents (47) limit the generalizability of this validation study to a broader audience of scholars. Also, 44% respondents indicated experience from computer science and engineering, with low participation from several academic fields, putting the generalizability of these results in question.

Next steps in this research study include 1) Analyzing questions that were not yet analyzed in this paper; and 2) Implementing the questionnaire on a wider basis as a means for better understanding the breadth and depth of immersive learning researchers and practitioners.

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