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Title: RheumMadness over two years: engaging participants in active learning and connecting early trainees to the rheumatology community

Running Title: RheumMadness Over Two Years

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Abstract

Objective: RheumMadness is an online learning collaborative that seeks to actively engage the rheumatology community. The objective of this manuscript is to analyze the educational experience of RheumMadness over two years.

Methods: Direct measures of participant engagement were obtained using web-based analytics. A post-tournament electronic survey was created to capture self-reported engagement and educational experience using the Community of Inquiry framework. Data were analyzed according to the following objectives: (1) compare demographics, engagement, and educational experience of participants between 2021 and 2022; (2) describe the educational experience of those who created "scouting reports;" (3) explore the impact of RheumMadness on early learners (medical students and residents).

Results: Compared with 2021, the 2022 tournament had more participants who submitted a bracket, more early learners, and more scouting report creators. Self-reported engagement and educational experience was high in both years of the tournament among all participants. Over 85% of scouting report creators reported that making a report was a fun and valuable learning experience. Early learners reported significantly higher levels of knowledge integration, sense of belonging in the rheumatology community, social connection, and overall learning experience compared with more advanced participants. 85% of early learners reported that RheumMadness increased their interest in rheumatology.

Conclusion: RheumMadness expanded from 2021 to 2022, engaging more participants in collaborative learning. Our results demonstrate that RheumMadness is particularly impactful among medical students and residents by helping them explore rheumatology topics and connect with the rheumatology community.

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Medical education is expanding beyond the traditional classroom setting to include newer technology platforms (1,2). In recent years, a variety of social media-based learning activities have supplemented the traditional medical education of many trainees and practicing providers. Examples of these types of social media-based activities include Tweetorials (threaded tweets that disseminate information in short snippets), visual based learning videos on Instagram, and discussion groups on Facebook. These learning activities offer the advantage of building social connections and engaging participants in active discussions about the learning material, strengthening the learning experience (3).

In 2021, we created a novel educational initiative called RheumMadness to create a place where a community of learners in rheumatology can come together (4). RheumMadness is an online collaborative learning activity in which rheumatology learning concepts compete as "teams" in a single elimination tournament, similar to the NCAA March Madness tournament. Participants attempt to predict the winner of each matchup against the choices of a "Blue Ribbon Panel" of judges and discuss the concepts in the tournament with other participants on social media. The Blue Ribbon Panel is comprised of six attendings (with a mix of academic/private practice, demographics, and years of experience) and one rheumatology fellow. The curricular model of RheumMadness is based on a similar initiative in nephrology called NephMadness (5-7). A short explainer video about RheumMadness is available in the supplementary material.

Learning theory can support the optimal design and analysis of social collaborative learning modalities (8,9). RheumMadness is based on the theories of gamification and social constructivism (10-12). By using game design elements that promote achievement and competition, gamification has been successfully used to increase attention and encourage engagement in medical education adult learning. However, this is not a one-size-fits-all

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phenomenon: using gamification strategies that support extrinsic motivation (earning points to win a prize) will achieve a much different goal than those that support intrinsic motivation (finding joy and fulfillment in the exercise itself). RheumMadness was designed with this in mind. While there exist some extrinsic motivators – such as creating a winning bracket – most elements of this tournament focus on self-direction and exploration. Allowing participants to choose how and when they interact with curricular elements ensures that learning is tailored to that specific individual, leading to more sustained engagement.

In the 2021 tournament, we analyzed the impact of RheumMadness using a social constructivist framework called the Community of Inquiry (CoI). This framework is grounded in the idea that the educational experience involves a group of individuals who collaboratively engage to generate knowledge in a shared space (13-14). The CoI seeks to describe a learner's educational experience in three "presences:" social presence (the ability for participants to identify and develop inter-personal relationships within a community), cognitive presence (the extent to which learners can construct and confirm meaning through reflection and discourse), and teaching presence (the design, facilitation, and direction of cognitive and social presences for the purpose of gaining worthwhile learning outcomes). By viewing the 2021 RheumMadness tournament through the lens of the CoI, we were able to demonstrate that most participants experienced high levels of each CoI presence and that increased engagement with each curricular element was associated with higher CoI presences (4). Furthermore, we identified subdomains of the CoI to target for improvement in future years of the tournament (4).

Our overall goal is to improve RheumMadness every year by reflecting on engagement data, survey results, and other metrics to help us understand the impact of curricular modifications and plan additional changes to make the tournament even better in future years.

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Therefore, the objective of this manuscript is to analyze the educational experience of RheumMadness after a second year of the tournament in 2022. Through this analysis, we will identify changes in participant engagement and educational experience from 2021 to 2022, describe the educational experience of creating a "scouting report" for the tournament, and describe how early learners (medical students and residents) experience RheumMadness compared with more advanced learners (fellows and attendings). In doing so, we hope to identify areas of improvement between the two years as well as areas for continued growth in years to come. Given current predictions of significant workforce shortage in the field of rheumatology, the level of engagement and experience of early learners was of particular interest. Generating creative ways to introduce trainees to the rheumatology and instill a sense of community is critical to engage and sustain our field. The ultimate goal of RheumMadness is to provide a sustainable platform where all people interested in rheumatology can engage in collaborative learning, and – ideally – enjoy doing so.

Methods

Curriculum Design

RheumMadness contains four major curricular elements: (1) the tournament itself, in which participants fill out their own "bracket," attempting to predict the winner of each matchup against the choices of the Blue Ribbon Panel using the following criteria: *which topic is the most important to patients, providers, and researchers, both now and in the future*; (2) "scouting reports," which are overviews of each topic written by rheumatology fellows, other trainees, and attendings from fellowship programs around the United States; (3) a RheumMadness podcast series reviewing each topic and providing tournament updates; (4) online discussion about

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RheumMadness through social media (primarily X, formerly Twitter) using the hashtag #RheumMadness. The themes and teams in the tournament are chosen by the leadership team based on their perception of what content will be most engaging for participants. All content in the scouting reports and podcast is reviewed by the leadership team for accuracy, and social media conversations are monitored by the leadership team to ensure correct information is shared. The tournament is intended for learners of all training levels: attendings, fellows, residents, medical students, and advanced practice providers. To participate in RheumMadness, learners fill out a bracket by selecting which topic they think will advance to the next round and ultimately win. These decisions are informed by the information they read in the scouting reports, hear in the podcast, and see on social media. The scouting reports are posted on the RheumMadness website and remain available after the tournament for continued learning.

The first RheumMadness tournament took place in March 2021, and the second tournament occurred in March 2022. Hereafter these tournaments will be referred to as the 2021 and 2022 tournaments, respectively. Participants were recruited through social media, emails, and tournament promotions in specialty newsletters and non-peer reviewed online journals. The teams in the 2021 tournament were based on high-impact manuscripts published in the preceding two years, and the bracket was organized around disease states (4). The 2022 tournament was organized around a central theme, “The Planet of the Rheumatologists,” (Figure 1). Each team in the 2022 tournament was grounded in one “base article,” but participants were encouraged to explore other articles and resources pertaining to these teams. Other updates to the curricular structure in 2022 included interviews with scouting report authors on the podcast and the creation of a RheumMadness newsletter with regular tournament updates. These modifications

were introduced in response to 2021 post-survey results demonstrating opportunities to improve participants' knowledge exploration, open communication, and group cohesion (4).

Assessment Instruments

Direct measures of participant engagement in RheumMadness were obtained through web-based analytics of each curricular element. Bracket submissions in 2021 were tracked through Challonge.com and in 2022 by Tourneytopia.com. The Tourneytopia software allowed us to collect direct reports of participant characteristics in 2022, as opposed to 2021 when this was not possible. Podcast downloads in 2021 and 2022 were tracked through Buzzsprout.com. Social media analytics in 2021 were tracked through Symplur and in 2022 through Keyhole. The number of scouting report authors excluded members of the RheumMadness leadership team.

An electronic survey assessed participants' educational experience in RheumMadness. Participants were invited to participate through email and social media. Survey invitations were sent over a period of 2 weeks immediately following the completion of each year of the tournament (2021 and 2022). Both the 2021 and 2022 surveys queried participants' training level, specialty, country of residence, role in tournament (general participant, scouting report creator, or Blue Ribbon Panel member), and self-reported engagement in each curricular component of RheumMadness (reading scouting reports, listening to podcasts, interacting on social media, and subscribing to a newsletter). Self-reported engagement was reported on a 5-point Likert scale (1 = no engagement, 5 = highest engagement). Participants' learning experience was captured using a modified version of the validated 34-item Community of Inquiry (CoI) survey. This survey assesses participants' agreement with prompts relating to each CoI presence and associated sub-domains according to a 5-point Likert scale (1 = strongly

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disagree, 5 = strongly agree). The 2021 survey included all 34 CoI items. Participants in the 2021 tournament provided feedback that the post-survey was too long, therefore the CoI portion of the 2022 survey was condensed from 34 items (with multiple items per CoI subdomain) to 10 items (one item per CoI subdomain). These 10 items were chosen by the RheumMadness leadership team based on their consideration of which items were most pertinent to the educational goals of RheumMadness. For the purpose of this analysis, we only analyzed the 10 CoI items that appeared on both the 2021 and 2022 surveys. The 2022 post-survey also included questions focused on the educational experience of scouting report creators. The full 2022 post-survey is included as Supplementary Material.

Data analysis

Data were analyzed to address the following research objectives: First, we sought to identify changes in participant engagement and educational experience between the 2021 and 2022 tournaments. To address this objective, we compared survey responses from 2021 versus 2022. In order to calculate an accurate response rate, this analysis was limited to respondents who submitted a bracket or were on the Blue Ribbon Panel. Second, we sought to understand the educational experience of creating a RheumMadness scouting report. To address this objective, we aggregated survey responses of all scouting report creators in 2021 and 2022 and compared those responses to participants who did not contribute to a scouting report in 2021 and 2022. To capture the educational experience of all scouting report creators, this analysis included all complete survey responses, including those who did not report submitting a bracket. Third, we sought to describe the impact of RheumMadness on early learners (medical students and residents) compared with more advanced learners (fellows and attendings). To address this

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objective, we aggregated survey responses of all medical students and residents in 2021 and 2022 and compared those responses to fellows and attendings in 2021 and 2022. Similar to the analysis of scouting report contributors, this analysis included all complete survey responses, including those who did not report submitting a bracket. To further understand any significant differences, we performed a qualitative analysis of social media comments and post-survey comments to identify illustrative quotes for each subdomain that were significantly different between early and advanced learners. This qualitative analysis was performed according to an established methodology for coding course transcripts according to CoI presences and subdomains (15). Quantitative analyses were performed in Excel using descriptive statistics, chi-square analyses, and two-sample unpaired T tests. The Duke Institutional Review Board determined this study exempt as educational research.

Results

Direct engagement metrics

According to direct metrics of participant engagement in RheumMadness, more people submitted a bracket in 2022 (n=121) than in 2021 (n=100). In 2022, 115 participants who submitted a bracket also answered questions about their training level during bracket submission. Of these 115 participants, there were 44 (38.3%) attendings, 34 (29.6%) fellows, 25 (21.6%) residents, 6 (5.2%) patients / interested citizens, 3 (2.6%) medical students, and 3 (2.6%) advanced practice providers. In addition, 93 participants answered questions about their country of residence, with 78 (83.9%) residing in the United States and 15 (16.1%) residing in the following non-U.S. countries: Australia, Canada, India, Indonesia, Ireland, New Zealand, Taiwan, and the United Kingdom. Regarding the RheumMadness podcast, there were fewer

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podcast episodes for the 2022 tournament (n=9) versus 2021 (n=15); however, on average, the 2022 podcast episodes were downloaded more times (245 per episode) than in 2021 (163 per episode). Regarding social media discussions about RheumMadness, there were 556 posts from 134 users and 1,930 total engagements (likes, retweets, replies) in 2022, slightly less than the 570 posts from 137 users and 2,392 engagements in 2021. The newsletter that was created for the 2022 tournament garnered 106 subscribers. The 16 scouting reports in 2022 were created by 61 contributors (42 fellows, 19 attendings) from 13 fellowship programs, compared with 16 scouting reports created by 48 contributors (44 fellows, 4 attendings) from 14 fellowship programs in 2021 (excluding members of the RheumMadness leadership team in both years).

Survey results

The post-tournament survey was sent to 128 participants in 2022, comprised of 121 participants who submitted a bracket plus 7 Blue Ribbon Panel members. The 2022 survey received 63 responses (response rate 49%), similar to the response rate seen in 2021 (58/107 = 54%), and 30 (48%) of the respondents in 2022 reported that they also participated in the 2021 tournament (Table 1). Respondents' reported stage of training on the 2022 survey was similar to direct metrics collected during bracket submission in 2022. A greater proportion of respondents in 2022 were residents or medical students (21% in 2022 versus 9% in 2021) and participated in scouting report creation (32% in 2022 versus 24% in 2021).

Regarding self-reported engagement in RheumMadness, a similar proportion of survey respondents in 2022 and 2021 reported reading at least half of the scouting reports (63% in 2022, 62% in 2021), listening to about half or more podcast episodes (38% both years), reading social media posts about RheumMadness at least once per week (71% in 2022, 72% in 2021), and

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posting about RheumMadness on social media (33% in 2022, 40% in 2021) (Table 1). Average Likert scale responses of self-reported engagement with each curricular element in RheumMadness were similar between 2021 and 2022 (Table 2). After aggregating survey responses from 2022 and 2021 (including additional responses from those who did not submit a bracket), fellow respondents who contributed to the creation of a scouting report in 2021 or 2022 had significantly lower engagement on social media compared to fellows who did not contribute to the creation of a scouting report. There was no significant difference in engagement between early learners (medical students and residents) and advanced learners (fellows and attendings).

The CoI portion of the survey demonstrated no significant difference in any CoI presence or subdomain among survey respondents in 2021 versus 2022 (Table 3). Fellow respondents who contributed to the creation of a scouting report in 2021 or 2022 had significantly lower average Likert scores on items related to the social presence compared to fellows who did not contribute to the creation of a scouting report. Early learners (medical students and residents) had significantly higher average Likert scores than advanced learners (fellows and attendings) in the following CoI domains: knowledge integration, affective expression, the overall social presence, direct instruction, and the overall teaching presence. Illustrative quotes from early learners pertaining to each CoI presence and subdomain are shown in Table 4.

The 2022 post-survey included additional questions to further explore the educational experience of participants who contributed to the creation of a scouting report. There were 27 respondents, comprised of 22 fellows, 4 attendings, and 1 resident. Of these respondents, 24 (89%) agreed or strongly agreed that “creating the scouting report was a valuable educational experience,” 23 (85%) agreed or strongly agreed that “I had fun creating the scouting report,”

and 23 (85%) agreed or strongly agreed that "creating the scouting report made me more interested in reading the other scouting reports" (Figure 2).

Both the 2021 and 2022 surveys asked early learners to respond to the following additional prompt: "What impact did RheumMadness have on your interest in rheumatology?" Of the 20 early learners (4 medical students and 16 residents) that responded, 17 (85%) indicated that RheumMadness increased their interest in rheumatology, 3 (15%) indicated no change in interest, and 0 (0%) reported decreased interest.

Discussion

RheumMadness continues to expand and reach a growing audience, particularly of early trainees. The Community of Inquiry that was developed in 2021 was sustained in 2022, as reflected by high cognitive, social, and teaching presences among survey respondents in both years. Updates to the curricular structure and topics from 2021 to 2022 did not lead to significant changes in participants' educational experience. Trends in participant engagement between 2021 and 2022 were similar with the exception of fewer social media posts in 2022, perhaps due to a slight increase in engagement with other components, as reflected by more podcast downloads per episode and the development of a newsletter.

The number of participants who contributed to the creation of a scouting report increased in 2022 compared to 2021. Scouting report creation is a voluntary activity for fellowship programs and requires a significant amount of time and collaboration among fellows, attendings, and other trainees during the scouting report creation process. Therefore, we were encouraged to find that over 85% of scouting report contributors in 2022 agreed or strongly agreed that scouting report creation was a fun and valuable educational experience, and that creating their

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own scouting report increased their interest in reading the scouting reports about other teams. Given the active nature of scouting report creation, we expected to find higher engagement and stronger educational experiences (as reflected by CoI scores) among fellow scouting report contributors versus non-contributors. However, fellow scouting report contributors had significantly less engagement on social media, lower average CoI scores in the social presence, and no difference in CoI scores in the cognitive or teaching presences. This suggests there may be two ways of actively engaging with RheumMadness content: (1) scouting report contributors actively engage with their local fellowship program to create a scouting report and review other scouting reports but are less likely to engage with others on social media, and (2) other participants who actively engage in discussions about RheumMadness content with the wider rheumatology community through social media. Creating a scouting report requires time and energy, which may have led to less time to engage in other components. Given only a subset of participants completed this survey, these results may additionally be affected of responder bias. Regardless, both groups had high average CoI scores in the cognitive presence, suggesting that both means of engaging in RheumMadness results in a meaningful learning experience.

RheumMadness is particularly impactful for early learners, who reported an increased sense of belonging in the rheumatology community and a deeper understanding of rheumatology topics compared with advanced learners. We saw an increase in the number of early learners participating in the 2022 tournament, which may be reflective of expanding the number of early learners in the leadership team that season. This created an environment where early learners were stakeholders in the program, and likely led to more peer-to-peer encouragement for participation.

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In light of the 2015 American College of Rheumatology Workforce Study indicating a projected 25% drop in full time equivalents (FTEs) and demand of rheumatologists outstripping the supply, solutions to increase the number of providers going into this field are now critical (16). Previous studies have focused on increasing clinical exposure during training to enhance interest in rheumatology (17,18). Harnessing a space that many trainees already use outside of the clinical environment may be a creative solution that has not been used to its full potential. In a meta-analysis of the usage of social networking sites (SNS) by medical students, the majority of respondents (75%) reported using social networking sites and 20% used these sites for sharing academic information, a trend which mirrors the general population (19, 20). Thus, social media can be harnessed to reach more early learners and engage them on a deeper level than the classroom or clinic alone. Our findings suggest that RheumMadness is accomplishing this goal. Further efforts to expand RheumMadness within early learner spaces by engaging Internal Medicine clerkships, resident consult rotations, and medical education leadership (Program Directors) could have far-reaching impacts. One of the biggest advantages of RheumMadness is its flexibility: this is a platform that can be access and used however and whenever an individual or group of people would like, making it attractive to international programs.

Our study has several important limitations. Our response rates of approximately 50% raise the question of responder bias. In addition, our understanding of the educational experience of scouting report authors and early learners is limited by small numbers of respondents in each group. The use of a modified CoI is also a limitation, in that the specific subset of questions used for our assessment has not been validated as a surrogate for the original CoI. Additionally, we only surveyed those who completed RheumMadness brackets. There exist other stakeholders whose inclusion would help us learn more about trends. For example, including Program

Directors, Internal Medicine clerkship directors, and general Rheumatology faculty at institutions whose fellowship programs complete scouting reports could help us establish if and how this is current integrated into programs. This will allow us to find further opportunities for growth.

Our results suggest that there are many opportunities for further growth of RheumMadness. For instance, a major strength of online platforms is the lack of geographical restriction; however, international participation in 2021 and 2022 was low. Social media comments and other participant feedback have indicated that one barrier to international engagement is the lack of familiarity among non-U.S. participants with March Madness-style brackets. In future years, we will address this barrier by providing more explainer videos and other resources to explain how the tournament works. To further expand the RhemMadness footprint, we keep in mind that the leadership team should reflect our intended audience; in future years, we plan to include more early learners and international rheumatologists to meet this goal. Another area of potential growth is in pediatric rheumatology. The majority of topics in RheumMadness 2021 and 2022 were focused on adult rheumatology, and to date only one pediatric fellowship program has participated in creating a scouting report. We will seek to expand pediatric rheumatology involvement in future tournaments. We can also work to maintain engagement among past participants. About half of 2022 participants reported that they also participated in 2021. While it is encouraging that we were able to recruit so many new participants in 2022, this data also suggests that many past participants don't participate again, and the reasons for this are unknown. Finally, offering continuing medical education (CME) credit could be beneficial in engaging practicing physicians. When NephMadness offered CME credits, more participants engaged in their tournament (particularly in private practice) and the quality of educational content improved (7). By recognizing these areas of growth, we can make

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adjustments and ensure that Rheum Madness is not a stagnant educational tool, but an evolving platform that continues to improve and meet the needs of our broader rheumatology community. Opportunities for growth require continued work from the RheumMadness leadership team. In 2022, the leadership team included 2 faculty, 3 fellows, 3 residents, 3 medical students, and 2 senior mentorship physicians. The leadership team meets throughout the year to discuss feedback from previous years, implement changes, create instructions for curricular elements, and analyze survey results at the end of the season. As the participants and curricular elements grow, the expansion of the leadership team mirrors this. For example, the addition of the newsletter in 2022 required time to plan, create, and disseminate. Conversely, the podcast was scaled down in number of episodes from 2021 to 2022, requiring less time to create and edit these episodes. Given the leadership team is made up of faculty and trainees with many other work commitments, recognizing the time and effort needed for each element is carefully considered when planning the next season.

In conclusion, RheumMadness is attaining the goal of creating a platform for all levels of rheumatology learners to come together and engage in collaborative learning. RheumMadness expanded in 2022 to include more tournament participants, scouting report authors, and early learners, indicating that the popularity continues to grow. Our findings support that participants learn (high levels of cognitive presence) and collaboratively create using the scouting report process. RheumMadness also inspires early learners to join the rheumatology community, which – if we can continue to grow – may have far-reaching effects. Future seasons should focus on creating a leadership team representative of our targeted audience (including pediatric and international rheumatologists), adjusting scouting report creation to be less time-consuming, and broadening the topics included for increased participation. These improvements will help

continue to create a community of people interested in rheumatology, not just those who are already a part of it. Overall, RheumMadness continues to grow as an effective tool for social collaborative learning in rheumatology.

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Author Contributions

All authors meet authorship criteria recommended by the International Committee of Medical Journal Editors, as follows:

1a. Substantial contributions to study conception and design

1b. Substantial contributions to acquisition of data

1c. Substantial contributions to analysis and interpretation of data

2. Drafting the article or revising it critically for important intellectual content

3. Final approval of the version of the article to be published

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Figure Legends

Figure 1. Bracket of teams for the RheumMadness 2022 tournament.

Figure 2. RheumMadness 2022 survey responses on participants' experiences with scouting report creation (n = 27).

Table 1. Participant characteristics on the post-survey, 2021 versus 2022

	2021 N = 107	**2022 N = 128**
Survey respondents	58 (54)	63 (49)
Training stage		
Attending physician	31 (53)	26 (41)
Fellow-in-training	19 (33)	21 (33)
Resident-in-training	4 (7)	10 (16)
Medical student	1 (2)	3 (5)
APP (in-training or fully trained)	1 (2)	1 (2)
Patient or other participant	0 (0)	2 (3)
Specialty (attendings, APPs, and fellows)		
Adult rheumatology	42 (82)	41 (85)
Pediatric rheumatology	5 (10)	4 (8)
Combined adult/pediatric rheumatology	3 (6)	3 (6)
Other specialty	1 (2)	0 (0)
Specialty (residents only)		
Internal medicine	3 (75)	10 (100)
Pediatrics	1 (25)	0 (0)
Country of residence		
USA	50 (86)	58 (92)
Non-USA	8 (14)	5 (8)
Created a scouting report	14 (24)	20 (32)
Blue Ribbon Panel member	7 (12)	7 (11)
Participated in previous year's tournament	N/A	30 (48)
Reported engagement		
Read at least half of the scouting reports	36 (62)	40 (63)
Listened to half or more podcast episodes	22 (38)	24 (38)
Read social media at least once per week	42 (72)	45 (71)
Posted on social media at least once per week	23 (40)	21 (33)
Subscribed to newsletter	N/A	38 (60)

All values reported as n (%) unless noted otherwise. APP: advanced practice provider.

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Table 2. Comparison of average Likert scale responses for self-reported engagement with each curricular element in RheumMadness according to three groups: (1) All participants in 2021 versus 2022, (2) Fellow scouting report contributors in 2021 and 2022 versus non-contributors in 2021 and 2022, (3) Early learners (medical students and residents) in 2021 and 2022 versus advanced learners (fellows and attendings) in 2021 and 2022.

	All participants		**Fellow contributors to scouting report creation**		**Training level**	
	2021 (n=58)	**2022 (n=63)**	**Contributors (n = 29)**	**Non-contributors (n=17)**	**Early learners (n=20)**	**Advanced learners (n=96)**
Reviewed scouting reports†	3.34	3.32	2.90	2.76	3.36	3.02
Listened to podcast†	2.29	2.36	2.17	2.71	1.29	1.28
Read social media‡	3.31	3.24	2.66*	3.71*	1.36	1.38
Posted on social media‡	2.14	1.94	1.41*	2.35*	1.25	1.17

* Indicates significant difference in Likert responses between groups ($p<0.05$)

† Likert response option 1 = none, 2 = some, 3 = about half, 4 = many, 5 = all

‡ Likert response option 1 = never, 2 = rarely (just once or twice), 3 = occasionally (about once per week), 4 = a moderate amount (several times per week), 5 = a great deal (about every day)

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Table 3. Comparison of average Likert scale responses for each Community of Inquiry (CoI) presence and subdomain according to three groups: (1) All participants in 2021 versus 2022, (2) Fellow scouting report contributors in 2021 and 2022 versus non-contributors in 2021 and 2022, (3) Early learners (medical students and residents) in 2021 and 2022 versus advanced learners (fellows and attendings) in 2021 and 2022.

	All participants		**Fellow contributors to scouting report creation**		**Training level**	
	2021 (n=58)	**2022 (n=63)**	**Contributors (n = 29)**	**Non-contributors (n=17)**	**Early learners (n=20)**	**Advanced learners (n=96)**
Cognitive presence						
Triggering: *RheumMadness activities piqued my curiosity*	4.46	4.41	4.21	4.29	4.45	4.33
Exploration: *I utilized a variety of information sources to explore topics*	3.53	3.57	3.72	3.65	3.65	3.56
Integration: *Reflection on RheumMadness activities helped me understand fundamental concepts*	3.97	3.97	3.79	3.94	4.35*	3.86*
Resolution: *I can apply the knowledge created in RheumMadness to my work or other activities*	4.14	3.94	4.03	4.12	4.15	4.03
Overall cognitive presence:	4.03	3.97	3.94	4.00	4.15	3.95
Social presence						
Affective expression: *Getting to know other participants through social media gave me a sense of belonging in the rheumatology community*	3.79	3.73	3.45	3.88	4.15*	3.61*
Open communication: *I felt comfortable interacting with other participants*	3.97	3.98	3.72	4.12	4.00	3.92
Group cohesion: *Online discussions helped me to develop a sense of collaboration*	3.82	3.75	3.62	3.88	4.00	3.70
Overall social presence:	3.86	3.82	3.60*	3.96*	4.05*	3.74*
Teaching presence						
Design/organization: *RheumMadness leadership provided clear instructions on how to participate*	4.48	4.35	4.34	4.41	4.45	4.31
Facilitation: *Leaders' actions reinforced the development of a sense of community*	4.26	4.21	4.17	4.29	4.45	4.18
Direct instruction: *Leaders helped to focus discussion on relevant issues in a way that helped me to learn*	4.26	4.19	4.17	4.18	4.55*	4.12*
Overall teaching	4.33	4.25	4.23	4.29	4.48*	4.20*

* Indicates significant difference in Likert responses between groups ($p<0.05$). Likert response options: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

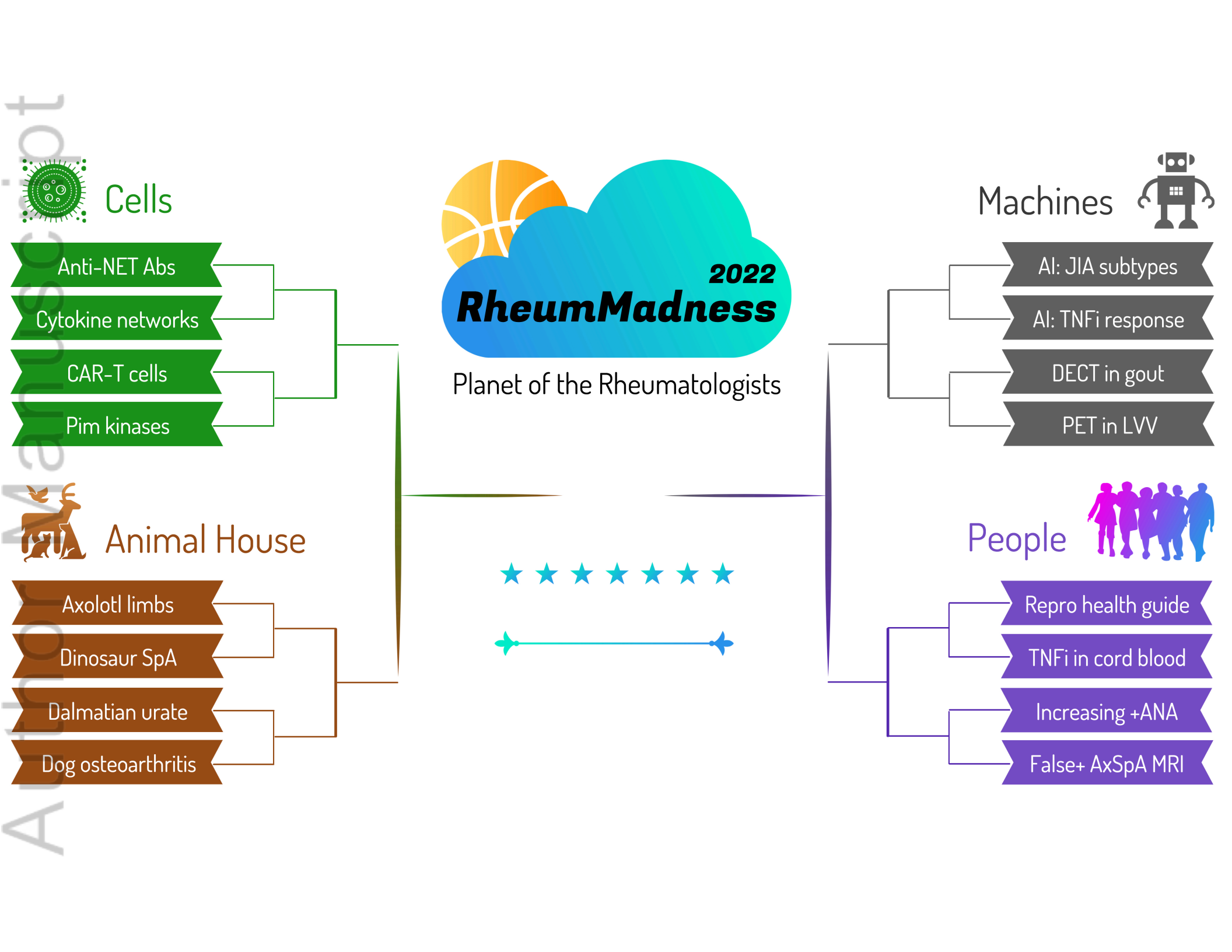
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Table 4. Illustrative Twitter and post-survey comments from early learners (medical students and residents) pertaining to each CoI presence and sub-domain.

Cognitive presence	
Triggering	*#RheumMadness: VEXAS. Cool new mystery kid on the block. Everyone knows their name. We wanna know more, but they're still too elusive.*
Exploration	*Wasn't able to enjoy #RheumMadness as much online as I wanted what with all the crazy going on in my life/country but I did like listening to the podcasts & reading some reports.*
Integration	*"Rheumatic diseases disproportionately affect women. We are not just autoimmune specialists. We are de facto women's health providers." - mic drop - You guys got me! #RheumMadness*
Resolution	*#RheumMadness 2: Relapsing Polychondritis - Simplified classification of RP=better understanding could possibly reduce current 10yr time to diagnosis!! Sample population limitations in number; local pt applicability*
Social presence	
Affective expression	*First time playing RheumMadness, but thoroughly enjoyed it. Other than learning about some amazing breakthroughs and new advances, I loved feeling like I was part of a bigger community. Really appreciate the rheumatology community!*
Open communication	*Participating in RheumMadness is quite possibly the nerdiest but also best thing I've done as a 3rd year medical student!*
Group cohesion	*Aah, was so sure about DECT in gout! Clearly I wasn't the only one – 53%! #RheumMadness*
Teaching presence	
Design/organization	*Thankfully there's a #RheumMadness Podcast! A go-to for people (like me) who are lagging behind on their bracket submission!*
Facilitation	*Just got to listenin' & thank you for the shout-out on the #RheumMadness podcast. Gr8 discussion as always.*
Direct instruction	*I had so much fun going through the #RheumMadness scouting reports. Very interesting teams. Can't wait to see who will be the winner!*

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