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ORIGINAL RESEARCH

The Use of Memes to Evaluate Reflection Levels in an Evidence-Based Practice Course for Nutrition Graduate Students: A Cross-Sectional Observational Study

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Background: Memes are a popular online communication tool that are participatory, playful and contextual in nature. While the use of meme creation as an education tool in higher education has been limited, meme creation requires students to reflect on material presented in the classroom, synthesize new content from learned concepts, and present it in a contextualized manner.

Objective: The objective of this study was to examine the level of reflection demonstrated in a meme creation assignment introduced into a master's level nutrition course which covered systemic and ethical issues related to nutrition, research, and clinical practice.

Methods: Participants were graduate-level dietetic students (n = 55) enrolled in an Evidence Based Practice course in a Master of Science/Dietetic Internship Program. Students were instructed to create a meme about content from the course. Memes were analyzed for depth of reflection using an existing quantitative framework and researchers conducted a hybrid thematic analysis.

Results: Of the 82 memes submitted, 9 (11%) were rated as reflection level 0 (description), 11 (13.4%) as level 1 (reflective description), 26 (31.7%) as level 2 (dialogic reflection), 15 (18.3%) as level 3 (transformative reflection) and 21 (25.6%) as level 4 (critical reflection). Four primary themes identified were Ethics, Philosophy of Science, Art of Science and Science and the Public.

Conclusion: Our findings confirm that the use of a meme creation assignment is an educational tool that promotes student reflection. Students displayed a higher-than-expected level of transformative or critical reflection which may be due to the playful, visual format of memes.

Keywords: dietetic students, reflective thinking, knowledge synthesis, thematic analysis

Introduction

The use of reflection, also referred to as reflective thinking, reflective learning, or reflective practice, is a valuable activity within education and professional practice.[1–3] Reflection has multiple meanings, though most often in education it is defined as a higher order cognitive and emotional process, over and above simple recall.[1,3,4] Reflection is an active and iterative process with different levels representative of varying degrees of analysis and critical synthesis.[5] Reflection has many documented positive outcomes within higher education, such as student improvements in professional development, autonomy, practical knowledge, empathic relationships, and effective practice.[6] The use of reflection can be operationalized in several different approaches including, but not limited to, reflection as part of journaling,[7] journaling with small group discussion,[8] collective class blogging requiring reflective style posts,[9] and online collective reflection.[10] However, it is noted that that students were more likely to write for teacher interest than focusing on their own reflective needs.[5]

Recently, Fleck and Fitzpatrick developed a tool for quantifying the depth of a reflection, on a scale from 0 (most superficial) to 4 (deepest).[11] Despite the theoretical value of implementing reflective activities in the classroom, many

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studies in education have shown written reflection assignments producing mostly superficial reflection.[12–14] These findings were disappointing, as deeper or more critical reflection is typically considered to produce better learning outcomes. Higher-level reflection among health care workers is necessary to interpret and evaluate outcomes of current clinical practices, analyze contributions and perspectives from other members of the health care team, and ultimately apply evidence-based practices to support optimal patient care.[15] All health care professions, including registered dietitian nutritionists (RDNs), have a set of ethical standards to guide professional practice based on the best available scientific evidence. Thus, there is a need for further research to develop and disseminate methods for increasing the depth of student reflections as emphasized by the Accreditation Council for Education in Nutrition and Dietetics (ACEND), the accrediting body of educational programs that prepare RDNs.[16] Examples of innovative teaching methods to improve critical thinking and clinical competency among nutrition students include, implementation of poetry and art analysis related to food insecurity[17] and the use of virtual escape rooms.[18]

We propose that memes may represent such a method for encouraging deeper reflection. Memes are a genre of online communication that are inherently participatory, characterized by the agency of consumer/producers.[19] Identification of memes as an artifact underscores the six common features of memes including: visual format, intertextual nature, cultural component, stance, virality, and imitation. Memes comprise various visual formats and include text and/or audio that enhance meaning and reflect the social and cultural environment. Often, the creation of meme is as simple as superimposing metaphorical descriptions onto publicly available images to relay a message or tell a story. The rapid spread of memes across digital spaces and ability to alter or remix messages demonstrate the participatory and accessibility of this communication. Memetic content is highly dependent upon the context for creation (ie social media sites such as TikTok vs meme image creator) but ultimately is all some kind of multimodal cultural artifact that is created, shared, and remixed online.[20] Additionally, the content is reflective of the participatory culture and, as such, has been identified as a form of contemporary folklore.[21] This shared portrayal of present-day culture can provide individuals with a sense of belonging and enhance social cohesion.[22]

Beyond the meme content, the activities of meme creation and sharing are playful experiences that can involve humor and self-expression/creativity.[23] Meme creation and sharing are reflective of social and collaborative interactions. When asked to use memes as a medium for daily journaling, users reported that they felt the meme journaling to be fun, self-expressive, and promoted reflection by requiring them to pay close attention to details.[24] Meme creation and sharing allows for individual creation and connection with others that possess similar interests.[25]

The inclusion of student creations such as memes is an emerging classroom tool in the education system. Memes have been studied in several different education settings, including STEM,[26] social sciences and humanities,[27] and health professions/medicine.[28] In contrast to assignments that are created solely for the instructor to evaluate which has limitations as a reflective tool, memes offer students the opportunity to create content for a broader audience. Additionally, use of a meme as a tool to reflect on a class content facilitates students exploring their thinking, learning, and assessment of the material at the personal, interpersonal, contextual, and critical levels as described by Smith.[29] Meme creation requires students to synthesize new content from learned concepts, encouraging higher order thinking consistent with the fifth level of Bloom's taxonomy[27] and a form of critical self-reflection which reconstructs understanding into new interpretations and forms of knowledge.[6] While memes do not explicitly state their premise, construction and understanding instead rely on collective knowledge, the interplay between text and images, embedded references and connections, and use of cultural references and satire.[30,31] A recent review found that use of memes in educational settings was associated with improved engagement, motivation, and critical thinking.[32,33] Specifically within medical and health professions education settings, several studies have found positive effects of meme use. Instructor use of pharmacology-related memes in class was associated with improved student grade performance in an undergraduate medical science course.[31] Two studies investigated the effects of student meme creation and sharing, one finding that memes facilitated reflection on professional identity among pharmacy students[34] and another finding that a pathology meme assignment was feasible and reported by students to be enjoyable and reduce boredom.[31]

Though meme assignments show promise for promoting relatively deep student reflection, several gaps in the literature remain. We are unaware of any studies that have investigated the use of memes in nutrition education nor any studies that have quantified the level of reflection found in student meme assignments. Thus, the purpose of this

study was to examine the outcomes of a meme creation assignment introduced into a master's level nutrition course which covered systemic and ethical issues related to nutrition, research, and clinical practice. The authors aimed to characterize if a meme creation assignment could facilitate a high level of reflection among nutrition graduate students. Additionally, we wanted to explore the topics that students chose to explore in the meme assignment and how they aligned with course objectives.

Materials and Methods

This present work was designed as a cross-sectional observational study to assess educational assignments completed by students enrolled in a graduate nutrition program.

Participants

All participants were graduate-level dietetic students enrolled in a face-to-face Evidence Based Practice course in the Master of Science/Dietetic Internship (MS/DI) Program offered by the Department of Nutrition Sciences and Health Behavior in the School of Health Professions at the University of Texas Medical Branch (UTMB) in Galveston, TX, USA. The Evidence Based Practice class is a required class for all students in the MS/DI Program. Our present analysis included three cohorts of students enrolled in the Evidence Based Practice class from 2021 to 2023 for a total sample size of 55 students which were the years that the meme assignment was presented in the course curriculum.

Ethical Considerations

This study was approved by the UTMB Institutional Review Board (#24-0065) via an expedited process and performed in accordance with relevant guidelines and regulatory requirements. Informed consent was not collected nor were participants compensated as the meme assignment was collected as part of regular classroom activities. All study data (demographic information, memes) was deidentified prior to analysis.

Educational Setting

The learning objectives of the Evidence-Based Practice class were as follows:

1. Evaluate the arguments surrounding the appropriateness of evidence-based practice
2. Demonstrate critical thinking regarding current hot topics in nutrition research
3. Discuss controversies related to research quality and measurement in nutrition research
4. Discover and evaluate nutrition-related scientific literature
5. Distill complex information about nutrition research into effective, easy-to-understand scientific communication

These objectives were designed to promote transformative and critical reflection among students through classroom discussions of a range of topics including the philosophy of science and research paradigms, the quality of research and measurement in nutrition science, ethical issues, and scientific communication.

Intervention

To evaluate student learning and integration of these complex topics, course instructors developed an assignment for students to submit a meme at the end of the semester that communicated a significant concept that they learned during the course of the class. The assignment was introduced in class toward the end of the semester and made available online in the student learning management system shortly thereafter. Briefly, the students were asked to create a piece of scientific communication, such as a meme, that communicates something they have learned in the class; although students were not provided specific instructions on how to create a meme, notably greater >95% of students chose to present a meme. A full version of the instructions for the assignment is found in Supplementary Information. The students presented their memes in class to their cohort of peers as part of the final assessment and submitted an electronic version of the meme to the course instructors. Students did not receive any verbal feedback on the memes during their presentation and received full credit as long as they successfully presented the meme.

Reflection Framework Used to Evaluate Student Work

The reflection framework presented by Fleck and Fitzpatrick provided the basis to analyze the level of reflection in the student-generated memes.[11] The framework defines five levels of reflection to serve as a resource for thinking about and designing a reflection with level 0 being the lowest score and a reflection level of 4 being the highest. Our rubric for this analysis (see below) was built upon the definitions in the original Fleck and Fitzpatrick manuscript as well as several subsequent content analyses that used adaptations of the scale to rate reflection levels in written reflections and health promotion mobile apps.[35,36] Some students chose to submit more than one meme and coders elected to code all submitted memes.

Reflection Level Descriptions

The following are brief descriptions of each reflection level score.

Reflection Level 0 (Description: Revisiting)

Memes rated as reflection level 0 were judged not to be reflective due to a description or statement without further information. Memes with a score of 0 often repeated or paraphrased information presented during the class. If the coders were unable to interpret the meaning of a meme, the meme received a score of 0.

Reflection Level 1 (Reflective Description: Revisiting with Explanation)

Memes rated reflection level 1 were judged to provide more justification than reflection level 0 memes but were still generally reportive or descriptive in nature and did not demonstrate a deeper change in student perspective. Memes at this level would provide standard information without much additional context or comparison.

Reflection Level 2 (Dialogic Reflection: Exploring Relationships)

Memes rated reflection level 2 were judged to exhibit reflection on more complex relationships and often provided a value judgement accompanied by a nuanced consideration of the topic, a change in perspective, consideration of the implications of a topic, and/or an application to student's own life. We anticipated that many memes would correspond to this level due to their templates involving inherent comparisons (ie Drake pointing at one concept but rejecting the other, or the American Chopper family arguing back and forth) or placing information in context (ie labeling different parts of a picture to represent related concepts).

Reflection Level 3 (Transformative Reflection: Fundamental Change)

Memes rated reflection level 3 were judged to exhibit reflection on a complex concept that the student was able to apply to a broader context such as ask a fundamental question, demonstrate how their personal assumptions were challenged and/or a significant shift in perspective or understanding due to personal insight. Memes rated level 3 might contain discussion of how course content changed a student's attitudes or values.

Reflection Level 4 (Critical Reflection: Wider Implications)

Memes rated reflection level 4 were judged to incorporate aspects of both a reflection level 2 and 3 where the student exhibited reflection on a complex topic and/or change in perspective/application to their own life as well as reflect on the topic in a broader cultural/societal/ethical context. Memes at this level were expected to apply information from the class to broad considerations, such as of the nature of science, how decisions surrounding health policies are made, and ethical controversies in nutrition research and policy. To be considered level 4, memes must have included critical investigation of a macro-level topic.

Qualitative Data Analysis

CCD, CM, EJL and EJAL conducted a two-phase analysis on students' memes addressing both the depth of reflection (quantitative) and aspects of evidence-based practice being addressed (qualitative). First, each of the four study team members independently rated the quantitative reflection level of each individual meme by evaluating the response against the reflection levels presented by Fleck and Fitzpatrick[37] and additional criteria outlined in Robertson et al.[36] Descriptors

to apply definitions of student reflection level were generated throughout the process. Then, the team conducted a qualitative thematic analysis following Braun and Clake's methodology.[36] First, each team member reviewed the memes several times to become familiar with the dataset. EAJL sorted memes by reflection level and CCD, CM, EJL and EJAL used a hybrid thematic analysis[38] to code the memes using inductive codes and deductive codes that were associated with the learning objectives of the Evidence Based Practice class. Once a codebook was established, the team met to create initial themes, discuss and review themes, then refine and name final themes. For both quantitative reflection coding and qualitative thematic coding, two investigators coded independently then met for comparison. The investigative team met for group discussion to come to consensus in situations in which the results differed by coder.

Analytical Rigor

For this mixed method study, we used a pragmatic paradigm as our approach to data collection and analysis. The thematic analysis was inherently subjective and was conducted by educators who have taught Evidence-Based Practice in the past. This deep knowledge of the subject and context was a topic of reflexive discussion during theme development and refinement. Triangulation of the quantitative and qualitative data was sequential, as we sorted the memes by their reflection level prior to conducting the qualitative analysis. We further triangulated results via merging (presenting results together) and connecting (using results of the quantitative analysis to inform the qualitative analysis).

Results

Participant Characteristics

A total of 55 students submitted memes that were included in this present analysis. The majority were female (92.7%) and non-Hispanic white (63%) with an average age of 23.8 y (Table 1).

Overall Meme Reflection Scores

Out of the 55 students across the 3 cohorts, 38 students submitted 1 meme, and 16 students chose to submit more than 1 meme for a total of 82 memes that were included in this analysis. One student chose to submit five memes. Of the 82 memes submitted, 9 (11%) were rated as reflection level 0 (ie *Description*), 11 (13.4%) as level 1 (ie *Reflective Description*), 26 (31.7%) as level 2 (ie *Dialogic Reflection*), 15 (18.3%) as level 3 (ie *Transformative Reflection*) and 21 (25.6%) as level 4 (ie *Critical Reflection*) (Table 2). There was some variation in level of reflection across the cohort years with the 2021 and 2022 cohorts having a relatively higher proportion of memes scored as reflective level 3 or reflective level 4 and a smaller proportion of memes with a score of 3 or 4 in the cohort from 2023.

Thematic Analysis

A thematic analysis of the content or topics that were incorporated in the student-generated memes identified four primary themes: Ethics (representative meme available in Supplementary Figure 1), Philosophy of Science

Table 1 Demographics of Graduate Nutrition Students Enrolled in a Class on Evidence-Based Practice

Attribute (n = 55)	
Sex (M/F, %)	4 (7.3) M/51 (92.7) F
Age (y; mean ± SD)	23.8 ± 2.07
Race; n (%)	43 (78) White
	3 (5) Black or African American
	2 (4) Asian
	5 (9) More than 1 race reported
	2 (4) Unknown/not reported
Ethnicity n (%)	8 (15) Hispanic or Latino
	47 (85) Not Hispanic or Latino

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Table 2 Frequency of Reflection Level Scores Presented as an Aggregate of All Student Cohorts as Well as by Cohort Year

Score	0	1	2	3	4
All cohorts; n (%)	9 (11.1)	11 (13.4)	26 (31.7)	15 (18.3)	21 (25.6)
2021; n (%)	0 (0)	3 (11.1)	11 (40.7)	4 (14.8)	9 (33.3)
2022; n (%)	1 (3.2)	5 (16.1)	9 (29.0)	8 (25.8)	8 (25.8)
2023; n (%)	8 (33.3)	3 (12.5)	6 (25.0)	3 (12.5)	4 (16.7)

(representative meme available in Supplementary Figure 2), Art of Science (representative meme available in Supplementary Figure 3) and Science and the Public (representative meme available in Supplementary Figure 4), each with emerging subthemes. Representative memes were included as supplementary material as the meme images submitted by students are not high enough quality to meet publication standards. Emerging subthemes included for the theme of Ethics included: Fundamental ethical principles, Ethical dilemma and Application of ethics in research and practice. Emerging subthemes for the theme of Philosophy of Science included "the struggle is real": Science is hard and Existence and philosophy. Emerging subthemes for theme of the Art of Science included Observation, Quality, Research Process, Bureaucracy and Efficacy. Emerging subthemes for the theme of Science and the public included Science mistrust and Social/cultural attitudes. These themes and emerging subthemes align with the learning objectives of the class; ie for students to develop a wider perspective of the philosophy of science and research paradigms, as well as ethical issues and scientific communication.

Frequently Used Meme Formats

Interestingly, when we examined commonly used meme formats, there were six meme formats that were utilized by three or more students (*Drake Hotline Bling, This is Fine, Math Lady/Confused Lady, Man Looking at Other Woman/Couple in bed, Two Buttons*). These meme format names are from the imgflip.com, a widely used meme generator as of June 2024.[39] The meme formats that were used most frequently aligned with the topical themes that were identified in the thematic analysis. The *Drake Hotline Bling* meme was used to convey a judgment based on knowledge or experience around a topic (Art of Science). The *Two Buttons Meme* also conveyed a judgement and builds in a layer of the difficulty or ethical dilemma surrounding the judgment/decision (Ethics, Art of Science). Similarly, *Man Looking at Other Woman/ Couple in bed* was used to metaphorically portray a moral or ethical dilemma (Ethics). Both the *Math Lady/Confused Lady* and *This is Fine* meme formats were used to convey the struggle of understanding complex topics or navigating challenging situations (Philosophy of Science, Art of Science, Ethics). Each of the commonly used meme formats was implemented at various levels of reflection.

Supplementary Figure 5 provides an example of a commonly used meme format (*Drake Hotline Bling*) evaluated at each reflection level (*Revisiting, Reflective Description, Dialogic Reflection, Transformative Reflection* and *Critical Reflection*). The contextual/collective interpretation of the Drake Hotline Bling meme is the singer, Drake, indicating gestures of things that are "not liked" (top image) in contrast to the gesture in the bottom image which is something that is "liked". It is such a common meme that, according to Meming Wiki, the use of it is called "Drakeposting".[40] Here, levels 0 and 1 have Drake liking and not liking information learned during the class, presented by itself or with minimal explanation. Level 2 shows a deeper level of reflection, applying information from class to a scenario in real life. Level 3 demonstrates a change in attitude towards scientific communication, applying discussions of positivism from class to beliefs about how research should be communicated to the public. Level 4 applies knowledge from class to beliefs about research at a societal level, providing commentary on the nature of truth and practical, day-to-day experience of conducting research in a post-positivist framework.

Discussion

In this work, we used memes as an atypical but engaging mechanism to facilitate learners' integration of the often-challenging topics with the practice of dietetics, particularly those involving ethics and scientific philosophy. The use of

memes appeared to be feasible and acceptable, with all students submitting a reflective meme and more than half submitting more than one. Low reflection levels were relatively rare, with only 11% and 13% rated as description (Level 0) or reflective description (Level 1). Levels of transformative (Level 3, 18%) and critical (Level 4, 26%) reflection were unexpectedly high. Most memes used commonly available formats, and several very popular formats such as *This is Fine* were used multiple times. The memes were grouped into four themes: Ethics, Philosophy of Science, Art of Science, and Science and the Public.

This study adds to a small but growing literature investigating the potential utility of memes as a creative method of encouraging student reflection in higher education. Their playful, creative, and social nature may help make reflection activities appear more appealing to students as compared to more standard reflective writing activities. Memes are inherently reconstructive, "remixing" content and concepts into something new. One of the purposes of reflection is to reconstruct understanding into new interpretations and new forms of knowledge,[6] meaning that memes may be inherently well-suited to facilitate the reflection process. Memes use something familiar (eg pictures of Drake or Real Housewives) with well-known interpretation to guide their expression of a concept. It stands to reason that this scaffolded remixing process may help students understand and express changes in perspective better than standard writing assignments without this type of guidance. Attempting to find an appropriate fit of meme format to concept could require critical reflection in that students must continuously consider whether their concept fits a certain format well and can be used in that meme. Even similar meme formats can have meaningfully different interpretations, so the process of choosing a format by necessity exposes students to very different interpretations of their concept of interest (eg was the experience of learning about p-hacking more like Zooey Deschanel's many ups and downs ending up in acceptance or like the man putting on clown makeup slowly realizing more and more previous assumptions were wrong?) This process may be similar to theorized processes of reflection such as developing different potential explanations and assessing assumptions.

To safeguard the validity of the meme reflective process, the researchers employed two strategies: 1) involve course instructors in the evaluation of student-generated memes for content, to limit ambiguity and determine whether assignment requirements were met; 2) evaluate all memes using an existing reflection level framework.[11,12,36] Because of this we do believe that students were able to successfully reconstruct understanding and critically reflect on knowledge gained in the class. Nearly half of the students (44%) submitted memes rated a level 3 or 4, which correlates to a high level of reflection. It is unclear why there is some variation in the level of reflection among the cohort. The same faculty were involved in planning and delivering the course and the course topics were similar. Additionally, all student meme submissions were anonymized with an alphanumeric code and the order they were analyzed for reflection was random.

A major barrier to reflection is students' lack of understanding of how to engage in it.[1,6] Reflective writing requires advanced linguistic and rhetorical skills, whereas meme formats can provide clear scaffolding to ease communication. For example, using the Drake Hotline Bling meme format automatically provides information that two concepts will be contrasted, with one shown as positive while the other is shown as negative. Many of the formats students chose for these assignments involved progression through various states (Zooey Deschanel making different faces, finding and rejecting the scroll of truth, etc.) or a clear conflict (Aladdin speaking to the Oracle, Anakin and Padme speaking back and forth, two choices on a sign, etc).

An important consideration is that we may have not interpreted the meme as the creator intended. R. Rogers (2001)[4] concluded that effective reflection in higher education is an act of deliberate, sustained, non-trivial cognitive processing of experiences and one's feelings about those experiences. Reflection is personal. Similarly, memes are vehicles for spreading one's personal views, even if not thoughtfully, carefully, or tastefully so. These memes retain their essential imagery and/or text but are otherwise stripped of information contradictory to the creator's personal message. While the Fleck and Fitzgerald's framework offers a useful system for assessing reflection, its focus is not the accuracy or correctness of the interpretation of the subject, topic, concept on which the creator reflected. However, when combined with memes as an andragogical tool, the framework can be useful for 1) evaluating the accuracy of reflection, ie did they properly understand the concept that they reflected upon; 2) sophistication of the meme as a measure of skill or effort at engaging in reflection; 3) effectiveness of the base meme to convey the reflected upon concept, ie was their meme choice a good one given the concept or topic they selected? Beyond the learner creating the meme and the faculty assessing the meme, a potential next step is for authors and viewers to meet and discuss their respective interpretations of the memes as an opportunity for deriving greater value from the exercise.

The relational nature of these memes may partially explain the unexpectedly large amount of deeper reflection (transformative and critical) shown in these assignments. Most studies in education have shown reflection assignments producing mostly superficial reflection at levels 0 and 1.[12–14] A major difference between shallower versus deeper reflection lies in attention to context and relationships. It may be that meme format scaffolding requiring conflict and/or progression could nudge students towards thinking more about different perspectives or how things change over time. Educators have used reflection rubrics to encourage deeper reflection, showing students the difference in focus and change across routine, dialogic, and transformative reflection.[41] The rubric uses words to facilitate student synthesis and reframing, whereas memes may use visual formatting to guide students into engaging in these activities.

Several limitations should be considered when interpreting these results. The sample size was relatively small and restricted to students in a combined Master of Science/Dietetic Internship program who were enrolled in an Evidence-Based Practice course. It is unclear whether these results are generalizable to other student populations or other courses. The nature of course content and/or students engaging in concurrent clinical rotations may have influenced the levels of reflection found in the meme assignments.

Additionally, coding reflection levels are relatively novel and not yet widely implemented. This study was formative and intended to provide initial information on the potential of meme assignments to promote reflection, rather than to provide evidence of efficacy or investigate relationships between variables. Further, because definitions have changed over time, our interpretations of reflection levels may differ from interpretations in other work. Exact definitions of reflection, deep reflection, and transformative/critical reflection remain controversial.[42]

Conclusion

Coding levels of reflection, including transformative and critical reflection, in student assignments are feasible and can be applied to memes. We found unexpectedly high amounts of transformative and critical reflection in our analyses of memes created in an evidence-based practice graduate course, suggesting that memes may be an effective method of encouraging students to think at a more macro level in their reflections.

Data Sharing Statement

Data will be made available upon request to corresponding author.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

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References

1. Lim RBT, Hoe KWB, Zheng H. A systematic review of the outcomes, level, facilitators, and barriers to deep self-reflection in public health higher education: meta-analysis and meta-synthesis. *Frontiers Media S A*. 2022;7:938224.
2. Dewey J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. D.C. Heath; 1933.
3. Mezirow J. On critical reflection. *Adult Educ Q*. 1998;48(3):185–198. doi:10.1177/074171369804800305

4. Rogers RR. Reflection in higher education: a concept analysis. *Innovat high educ*. 2001;26:37–57. doi:10.1023/A:1010986404527
5. Mann K, Gordon J, MacLeod A. Reflection and reflective practice in health professions education: a systematic review. *Adv Health Sci Educ*. 2009;14:595–621. doi:10.1007/s10459-007-9090-2
6. Van Beveren L, Roets G, Buysse A, Rutten K. We all reflect, but why? A systematic review of the purposes of reflection in higher education in social and behavioral sciences. *Educ Res Rev*. 2018;24:1–9. doi:10.1016/j.edurev.2018.01.002
7. Walker SE. Journal writing as a teaching technique to promote reflection. *J Athl Train*. 2006;41(2):216–221.
8. Kember D, Jones A, Loke A, et al. Encouraging critical reflection through small group discussion of journal writing. *Innovat Educ Training Int*. 1996;33(4):213–220.
9. Chretien K, Goldman E, Faselis C. The reflective writing class blog: using technology to promote reflection and professional development. *J Gen Intern Med*. 2008;23(12):2066–2070. doi:10.1007/s11606-008-0796-5
10. Lord AY, Chen M-P, Cheng -Y-Y, Tai K-C, Pan W-H. Enhancing nutrition-majored students' reflective judgment through online collective reflection. *Comput Educ*. 2017;114:298–308. doi:10.1016/j.compedu.2017.07.010
11. Fleck R, Fitzpatrick G. Reflecting on reflection: framing a design landscape. 2010;216–223.
12. Fleck R. Rating reflection on experience: a case study of teachers' and tutors' reflection around images. *Interact Comput*. 2012;24(6):439–449. doi:10.1016/j.intcom.2012.07.003
13. Mekler ED, Iacovides I, Bopp JA. "A game that makes you question." Exploring the role of reflection for the player experience. 2018;315–327.
14. Bjerkvik LK, Hilli Y. Reflective writing in undergraduate clinical nursing education: a literature review. *Nurs Educ Pract*. 2019;35:32–41. doi:10.1016/j.nepr.2018.11.013
15. Sherwood G. Reflective practice and knowledge development: transforming research for a practice-based discipline. *Int J Nurs Sci*. 2024;11(4):399–404. doi:10.1016/j.ijnss.2024.08.002
16. Academy of Nutrition and Dietetics. Code of ethics for the nutrition and dietetics profession. Availabe from: https://www.eatrightpro.org/practice/code-of-ethics/code-of-ethics-for-the-nutrition-and-dietetics-profession. Accessed December 3, 2025.
17. Huye H. Using poetry and art analysis to evoke critical thinking and challenging reflection in senior-level nutrition students. *J Nutr Educ Behav*. 2015;47(3):283–285.e1. doi:10.1016/j.jneb.2015.01.007
18. Wanik JA, Schlesselman LS, Shanley E. Student-designed nutrition escape games to improve clinical competency and engagement. *J Nutr Educ Behav*. 2022;54(9):886–888. doi:10.1016/j.jneb.2022.04.211
19. Wiggins BE, Bowers GB. Memes as genre: a structurational analysis of the memescape. *New Med Soc*. 2015;17(11):1886–1906. doi:10.1177/1461444814535194
20. Rogers R, Giorgi G. What is a meme, technically speaking? *Inform Comm Soc*. 2024;27(1):73–91. doi:10.1080/1369118X.2023.2174790
21. Holm CH. What do you meme? The Sociolinguistic potential of internet memes. *Leviathan*. 2021;12(7):1–20.
22. Mifdal M. Covidly humorous memes. *Eur J Humour Res*. 2022;10(3):189–210. doi:10.7592/EJHR.2022.10.3.688
23. Mortensen M, Neumayer C. The playful politics of memes. In: *The Playful Politics of Memes*. Routledge; 2023:1–11.
24. Terzimehić N, Schött SY, Bemmann F, Buschek D. MEMEories: internet memes as means for daily journaling. 2021;538–548.
25. Seiffert-Brockmann J, Diehl T, Dobusch L. Memes as games: the evolution of a digital discourse online. *New Med Soc*. 2018;20(8):2862–2879. doi:10.1177/1461444817735334
26. Sidekerskienė T, Damaševičius R. Pedagogical memes: a creative and effective tool for teaching STEM subjects. *Int J Math Educ Sci Technol*. 2025;56:1–31. doi:10.1080/0020739X.2024.2328818
27. Kath LM, Schmidt GB, Islam S, Jimenez WP, Hartnett JL. Getting psyched about memes in the psychology classroom. *Teach Psychol*. 2022;51(3):345–351.
28. Subbiramaniyan V, Apte C, Ali Mohammed C. A meme-based approach for enhancing student engagement and learning in renal physiology. *Advanc Physiol Educ*. 2022;46(1):27–29. doi:10.1152/advan.00092.2021
29. Smith E. Teaching critical reflection. *Teach Higher Educ*. 2011;16(2):211–223. doi:10.1080/13562517.2010.515022
30. Vacca R, DesPortes K, Tes M, et al. What do you meme? Students communicating their experiences, intuitions, and biases surrounding data through memes. 2022;212–224.
31. Elkhamisy FAA, Sharif AF. Project-based learning with memes as an innovative competency-boosting tool: a phenomenological interpretive study. *Interactive Learning Environ*. 2022;1–18.
32. Rodriguez-Guillen MP, Zavala-Parrales AC, Valerio-Ureña G. Integrating memes: enhancing education with pop culture a systematic literature review. 2024;538–545.
33. Tidy H, Bolton-King RS, Croxton R, et al. Enhancing the student learning experience through memes. *Science Justice*. 2024;64(3):280–288. doi:10.1016/j.scijus.2024.03.004
34. Doctor N, G. Elder K, Hafling B, F. Leslie K. Impact of pharmacy-related memes on students' professional identity formation. *Am J Pharmaceut Educ*. 2024;88(3):100657. doi:10.1016/j.ajpe.2024.100657
35. Cho J, Xu T, Zimmermann-Niefield A, Voida S. Reflection in theory and reflection in practice: an exploration of the gaps in reflection support among personal informatics apps. 2022;1–23.
36. Robertson MC, Cox-Martin E, Basen-Engquist K, Lyons EJ. Reflective engagement with a digital physical activity intervention among people living with and beyond breast cancer: mixed methods study. *JMIR mHealth uHealth*. 2024;12(e51057):e51057. doi:10.2196/51057
37. Fleck R, Fitzpatrick G. Reflecting on reflection: framing a design landscape. presented at: Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction; 2010; Brisbane, Australia. 1952269.
38. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101. doi:10.1191/1478088706qp063oa
39. Imgflip LLC. Available from: www.imgflip.com. Accessed June 2024.
40. Drakeposting. SUNINVEST D.O.O. Available from: https://en.meming.world/wiki/Drakeposting. Accessed February 20, 2026.
41. Ward JR, McCotter SS. Reflection as a visible outcome for preservice teachers. *Teaching Teacher Educ*. 2004;20(3):243–257. doi:10.1016/j.tate.2004.02.004
42. Schaepkens SPC, Veen M, de la Croix A. Is reflection like soap? A critical narrative umbrella review of approaches to reflection in medical education research. *Adv Health Sci Educ Theory Pract*. 2022;27(2):537–551. doi:10.1007/s10459-021-10082-7