Filling the Knowledge-to-Action Gap with Open Access Pedagogy: An Alternative Assignment Model

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ABSTRACT

Knowledge translation (KT) is key to the scientific process, yet academic work produced often does not reach the public. In this article a unique undergraduate KT term assignment is presented where students summarize a large body of research into an artifact for public use. This assignment model may increase student engagement and learning outcomes while filling the knowledge-to-action translation gap. The option dovetails students' and employers' need for demonstrative performance prior to hiring, the academic push for publicly and freely available scientific knowledge (e.g., open access), and challenges involved with engagement with advanced material in both in-person and remote environments. The assignment is presented in the context of benefitting effective KT and enhancing open access to information; it is then analyzed using the American Psychological Association's (APA) goals for undergraduates alongside Bloom's Taxonomy of Learning. Various APA goals accomplished through the assignment, benefits, limitations, and future directions are highlighted.

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INTRODUCTION

Science involves dissemination of knowledge gained through research. In fact, *knowledge translation* (KT, "the dynamic and iterative process that includes the synthesis, dissemination, exchange, and ethically-sound application of knowledge;" CIHR, 2020) and knowledge *mobilization* (i.e., producing and using research results; SSHRC, 2019), are required steps in the Canadian research funding process. *Implementation science* and *research utilization* are terms used in the United Kingdom, while *dissemination, diffusion, research use, knowledge,* and *uptake* are found in the United States (Graham et al., 2006). The lack of research translation into policy and practice is a constant challenge (Grimshaw et al., 2012) known as the *knowledge-to-action gap* (Graham et al., 2006). It often takes an average of 17 years for KT-to-action to occur (Wolfenden et al., 2015). Would it not benefit science and society if University assessments could help fill this gap by translating knowledge to end users? That is one of the key goals of this assignment option.

Open access to information (OA) is a concern for the public and academia, referring to the unrestricted, free access to electronic information that can increase public use of scientific knowledge (UNESCO, n.d.a). Increasing student engagement in higher education is a constant challenge (Kahu et al., 2017) especially in remote learning (Adedoyin & Soykan, 2020). The assessment option described and analyzed here helps address these concerns while providing students with a creative opportunity to build skills for their postbaccalaureate goals (APA, 2013). In the assignment, students create a novel KT artifact of their choosing that transfers scientific knowledge to a target audience for uptake and use. Evaluations of the assignment from students, teaching assistants, and the instructor continues to be overwhelmingly positive and the accomplished learning goals (APA, 2013) and outcomes supported by the assignment are incontrovertible.

The benefits of KT and OA to information will be provided followed by a description and analysis of the assignment. Implications of the assignment for KT, student engagement, and undergraduate learning goals are highlighted using Bloom's (1956) revised Taxonomy of Learning (Armstrong, 2010) and the American Psychological Association's goals for undergraduates (APA, 2013, hereby referred to as *Goals*). Finally, a summary of the perceived impact of the assignment is provided along with limitations and future directions.

KNOWLEDGE TRANSLATION

Translating scientific findings to target audiences results in the greatest possible impact of change and applicable use. Within academia, KT guides research plans, theoretical hypotheses, interpretations, and methods (SSHRC, 2021). For the public and policymakers, knowledge mobilization plans shape public debate, policies, and clinical practice (SSHRC, 2021) resulting in true evidence-based practice (Grimshaw et al., 2012). Public services can be enhanced, business decisions informed, and groups including the government, media, practitioners, educators, and society can benefit from translated scientific facts (Straus et al., 2011).

Knowledge transfer theory is concerned with the *push* (active KT to the public such as article publication) and *pull* (active investigation of users' research needs) of knowledge transfer, also called *knowledge brokering* (Bowen & Graham, 2013). Finding new means of sharing scientific knowledge with potential users, such as the artifacts produced in this assignment option, will help move the KT metaphor forward (Engebretsen et al., 2017). Contemporary modes of KT (e.g., non-traditional media such as websites and social networking) offer a ripe opportunity to reach a range of audiences to help fill this gap in the research process. In this assignment, while choosing their mode of KT, students must sample a range of material within the content domain to identify an area with sufficient empirical basis to provide translated knowledge to an audience (i.e., *KT push*). The target audience must be identified in the process – who are the end users of the artifact, and what are their knowledge transfer needs (i.e., *KT pull*)?

Professional skills and resources are needed for effective KT (Bowen & Graham, 2013) and KT sources must be credible (Grimshaw et al., 2012). Findings must be accurately, yet creatively, prepared for a target audience with a purpose (Shea, 2011). University student recommendations

should be deemed more credible by users than recommendations made from the public. Information sources available to these knowledge translators (e.g., library subscriptions) and their respective multiliteracy skills should positively influence the comprehensiveness, contemporaneousness, and accuracy of the translated information. *Multiliteracy skills* refer to skills beyond typical literacy that are culturally and linguistically diverse and delivered through different modalities (Cazden et al., 1996). Opportunities to build multiliteracies in education aid students' career development by preparing them to be global citizens (Cazden et al., 1996) through engagement with their preferred media and modalities (Briere & Wilson, 2018). Building upon students' existing skills and knowledge, while encouraging them to incorporate creative alternatives to the traditional essay can enhance multiliteracies, increase interest, motivation, and subsequent engagement with the material.

For KT uptake, topic and format are important so that the information is useful, easy to understand and apply, and of direct interest to the target audience (Wolfenden et al., 2022). The *Knowledge-to-Action Framework* (Graham et al., 2006) respects KT as a process involving knowledge creation. *Knowledge creation* is not just research inquiry itself, but the generation of artifacts that effectively convey current knowledge to audiences in user-friendly formats (Graham et al., 2006). Currently, and historically (Grimshaw et al., 2012), systematic reviews have served as such *second-generation knowledge* (Graham et al., 2006) for end users. However, the *knowledge-to-action gap* remains and a call for alternative approaches to KT are being made (e.g., Gagnon, 2011). Empowering students to create artifacts that rely on and build upon multiliteracies in specific content domains may benefit students, their learning outcomes, and also end users by enabling them to remain current in the domain. Using an OA format with *creative commons licensing* would help disperse the knowledge while keeping it up-to-date with permitted modifications. With this license, end users can reproduce, reuse, or revise the material based on the creator's licensing decisions (Creative Commons, n.d.). Benefits of OA in science and education are briefly discussed next. How these benefits can increase student engagement, along with the benefits of such engagement, will be reviewed when possible.

STUDENT ENGAGEMENT & OPEN ACCESS TO INFORMATION

Publicly funded research should be made publicly available once complete, a key argument driving policy shifts towards OA. OA principles encourage research outputs in digital formats that are free from access barriers like fees, reproduction limits, and reuse (UNESCO, n.d.b). OA allows wider application of findings, results in more citations, quicker access to recent research, more interdisciplinary collaboration, and overall, more public engagement with the material (Gagnon, 2011). Some government funding agencies even require an OA publication regarding the completed, funded research (CIHR, 2019).

OA pedagogy has resulted in millions of saved textbook dollars (University of Saskatchewan, n.d.), improved course content, and can allow students to demonstrate their skills to future employers (Appleby et al., 2019). Opportunities to publish undergraduate work are challenging and rare as few venues exist, especially for the public. Yet, undergraduate research publications enhance student experience and promote employment-related skills (Rose, 2014). Thus, having students complete a KT assignment that synthesizes empirical findings to generate an artifact prepared for a target audience possesses tremendous teaching and learning potential with minimal dissemination cost.

Providing a public link to a sample of one's work in a resume helps students demonstrate their multiliteracies prior to employment. Employers and future employees may appreciate the opportunity to evaluate candidates' work. Graduating students with the skills required to be competitive in a global market should be a hallmark of any higher education institution and this assignment style can help develop and showcase such skills.

Learning the benefits of OA and supporting the rationale that the assignment facilitates their learning, potential future employment, and assists the public seems to enhance student engagement (Jang, 2008). *Student engagement* refers to involving students in academic activities in meaningful ways (Collaço, 2017) and should be a priority for any course (Mandernach et al., 2011) because higher engagement results in more positive learning outcomes (Webber et al., 2013).

Engagement is often conceptualized as including behavioural, affective, and interpersonal components (Collaço, 2017). *Behavioural components* include such things as attending to the information, being cognitively and physically present in teaching and learning activities, and reading more than required (Bryson & Hand, 2007). *Affective* aspects relate to one's emotional involvement with the material (Handelsman et al., 2005), the degree of enjoyment with it and general enthusiasm towards reading for the pleasure of learning (Bryson & Hand, 2007). *Interpersonal components* involve interactions with the instructor, teaching assistants, and peers (Handelsman et al., 2005). Other qualities may affect engagement such as multiliteracy skills (Briere & Wilson, 2018), general learning skills, and overall performance (Handelsman et al., 2005). The format and design of the assignment has been refined to enhance student engagement with these components in mind. The assignment details used to accomplish these tasks are outlined next.

THE KT ARTIFACT ASSIGNMENT

Across three iterative Cognitive Developmental Psychology courses, a seminar-style learning module and assignment were created to educate students about KT, OA, and creative-commons licensing (the full assignment guide is available at https://sites.usask.ca/psy-317-ktr/wp-content/uploads/sites/303/2022/12/KT-Assignment.docx). It included a step-wise approach to the assignment, learning outcomes, information for review and discussion, a guest lecture on licencing, assignment requirements with a rubric, deadlines, and possible artifact ideas, such as two infographics, one video, and one graphic novel. A link to the online artifact repository was also included and reviewed in class.

Students searched the literature to consider topics of personal interest and with adequate breadth and depth of research (APA, 2013). Once identified, at least two supporting articles (e.g., meta-analyses, reviews, original articles) were emailed to the instructor for approval, along with the topic and artifact idea. Some examples include infographics, slideshows, blogs, Wikipedia entries, YouTube videos, educational brochures, pamphlets, modules, or study guides, webpages, graphic novels, and toolkits for parents, caregivers, or practitioners (see the repository at https://sites.usask.ca/psy-317-ktr for examples).

A draft of the artifact was first submitted for peer review using the rubric. Peers had one week to complete the review and its quality contributed to their grades. Students then had a week with the feedback to revise their artifacts. Those who received minimal feedback or were hoping to receive more feedback posted their artifacts in a discussion thread for live class review. These were displayed in class and the instructor provided feedback and teaching on content, KT, design, style, referencing, format, writing-level, potential areas to improve, and more. Their final artifact was submitted for grading one month later. Upon completion of the course, invitations were sent to post their artifact on the repository using temporary administrator status (the Instructions are available at https://sites.usask.ca/psy-317-ktr/wp-content/uploads/sites/303/2022/12/Instructions.docx).

CRITICAL ANALYSIS OF THE ASSIGNMENT AND LEARNING OUTCOMES

Educators' and students' critical assessments of the assignment were overwhelmingly positive and this trend continued when it was contrasted against Armstrong's (2010) visualization of Krathwohl's (2002) revision to Bloom's (1956) *Taxonomy of Learning.* The benefits are further elucidated when analyzing the APA Goals (APA, 2013) for undergraduates against the steps involved with the assignment. In Figure 1, the revised taxonomy and Goals are overlayed with key skills developed through the assignment and will serve to organize the remaining analysis. No formal research data is yet available to evaluate engagement. Knowledge was drawn from the instructor's and teaching assistants' experiences, feedback on formal and informal teaching and course evaluations, and students' open-ended feedback.

Bloom's Taxonomy pyramid (top to bottom):

Create
- Produce a Knowledge Translation Artifact for course assessment and public dissemination.
- Goals: 4.1, 4.2, 5.1, 5.5

Evaluate
- Give and receive peer evaluations and participate in class critque of selected work with oppotunties to revise throughout the process.
- Goals: 3.2, 4.3, 5.1, 5.2, 5.3, 5.5

Analyze
- Organize a large body of research to connect related information, identify gaps in scientific knowledge, and find public need for knowledge uptake.
- Goals 2.5, 3.1, 3.3

Apply
- Present key information to translate into action using an effective summarized format and one's multiliteracies.
- Goals: 2.3, 2.4

Understand
- Explain complex information accurately, clearly, and concisely to a target audience.
- Goals 2.1, 2.2

Remember
- Recall and define concepts in the content domain to state key information for a target audience.
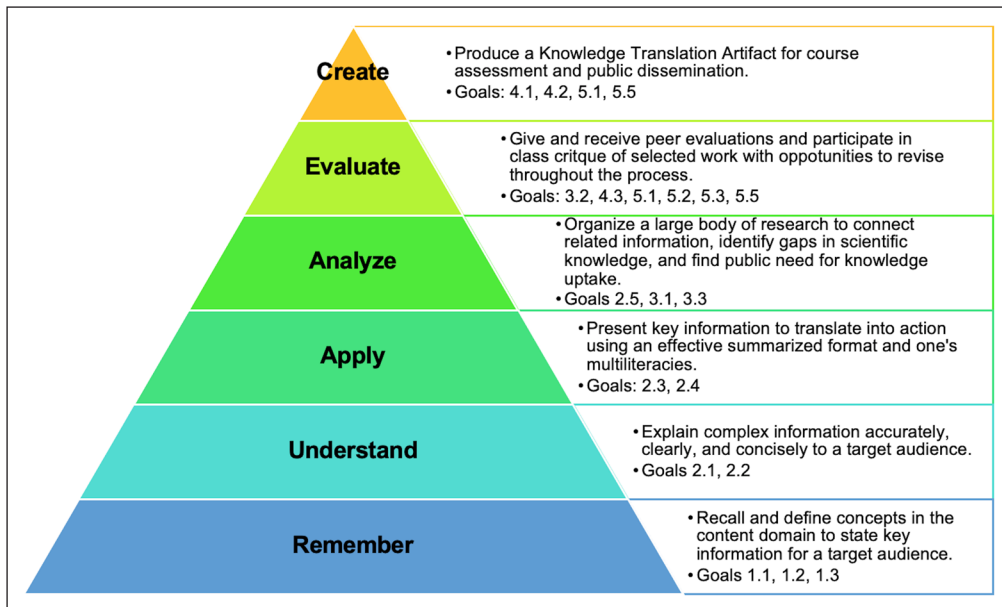- Goals 1.1, 1.2, 1.3

Figure 1 Bloom's Taxonomy (1956) and the American Psychological Association's (APA, 2013) goals for undergraduate psychology students combined and analyzed with the Knowledge Translation Artifact assignment plan. A reproduction of Armstrong's (2010) visual depiction of Krathwohl's (2002) revision to Bloom's Taxonomy is provided in the pyramid. Some associated skills and activities that relate to each level of the taxonomy are provided in the first bullet on the right followed by the APA Goals that are reached with that aspect of the assignment. *Goal 1* relates to basic knowledge of psychology. *Goal 2* is concerned with the scientific process and critical thinking skills. *Goal 3* focuses on ethics and social responsibility in the face of diversity. *Goal* 4 encompasses the importance of various forms of communication. The core of *Goal 5* is the student's professional development.

In Bloom's Taxonomy, *remember* refers to one's ability to recall facts and basic information in the content domain (Armstrong, 2010; Bloom et al., 1956). Creation of a KT artifact that distils a large swath of research down to a concise and usable format relies on students' mastery and understanding of the knowledge in the area (Goals 1.1, 1.2, 1.3). They must rely on existing knowledge and actively seek new information to fill gaps in understanding.

Engagement can be enhanced through *active learning* environments (e.g., Doyle, 2008) which involves students searching for information that increases their personal comprehension (Collaço, 2017), a dominant activity in the assignment. Students' anecdotal reports of valuing this active learning environment is supported by the literature (Lumpkin et al., 2015). *Learning-centred environments* also promote engagement and are similar, but specify student responsibility in their learning (Doyle, 2008). Working in problem-based learning environments also fosters student engagement (Delialioglu, 2012) and the use of multimedia and technologies seems to support active learning (Schrand, 2008).

To complete the assignment, students must search for information that they think will solve a tangible knowledge gap for an identified target audience while relying on some existing knowledge and seeking new information (active learning). Readings must be thoroughly digested to determine whether they can be accurately extended and applied into KT action (learning-centred). Throughout the assignment, students can enhance existing skills and develop new ones both in and outside of their academics (e.g., merging one's passion for community-service or art with KT and assessment). Solving a real-world problem in a novel, creative, multiliterate way seems to enhance engagement and yields exciting artifacts for instructor assessment and informative ones for public use.

Students appeared to spend more time in the literature while completing this assessment compared to typical essay-style formats. Student engagement can be viewed on a continuum from *disengaged* to *engaged* with different levels achieved in different areas by the same student (Bryson & Hand, 2007). Here, engagement with the materials to complete the assignment typically went beyond expectations. Students read and referenced significantly more than the minimum required. Student interest, enthusiasm, desire to read for pleasure in the area, and reading more than required are viewed as indicators of positive student engagement (Bryson & Hand, 2007). These factors should be sought by educators (Mandernach et al., 2011) and seemed to be accomplished with this assignment, although not yet empirically evaluated. To highlight these characteristics and develop expertise, the instructor encouraged students to work within an area where they had pre-existing knowledge and interest. This also sought to accomplish Goals 1 (Knowledge Base), 4 (Communication), and 5 (Professional Development) by encouraging mastery, depth, breadth, and self-efficacy.

Understanding (ability to explain ideas and concepts within the content domain; Armstrong, 2010) of students' chosen area can be enhanced with the required assignment brevity (i.e.,

short, usable format) and density (i.e., breadth and depth of resources required). Goals 2.1 and 2.2 were accomplished by students flexing their scientific reasoning, interpretation, and psychology literacy to select and synthesize facts into action and recommendations. Students excelled at providing detailed background that the target audience would require. Student engagement, learning, and knowledge in the area was appreciable in each artifact. Given that the writing level of the assignment (if for the public) was to be prepared for Grade 8–10 (Hango, 2015), a strong understanding of the advanced material was required to communicate it effectively and concisely. This requirement reportedly took effort from students, however, translating information in this fashion appeared to enhance understanding as the essence had to be understood, then translated into simpler language for others' consumption.

The *apply* tier involves the use of information in new situations (Armstrong, 2010). Identifying the audience was accomplished well, as was using and developing students' multiliteracies to select and create the artifact. Degree of personal skill in the assignment varied but allowing multiple artifact formats permitted students to showcase their skills in a professional, academic setting (Goal 5: Professional Development). Part of student engagement involves meaningful academic activities and pursuits (Delialioglu, 2012) and students find intrinsic value in their academics when they perceive personal relevance and importance in the work (Miller & Brickman, 2004). The fact that the final product could potentially be used to advance their careers and professional development (Goal 5) seems to have increased personal relevance and subsequent engagement. Students reported that knowing that peers and the public would view their work resulted in greater self-investment. An educator's role is to help students interact with the content and have them create their own knowledge (Lumpkin et al., 2015); this was fulfilled with this assignment. Further, educators' enthusiasm influences student engagement (Bryson & Hand, 2007). Experiencing the heightened interest and engagement from students, along with the high quality artifacts previously produced undoubtedly increased the instructor's enthusiasm which may also have transferred to students.

Within *analyze* (Armstrong, 2010), organized connections among ideas and relationships across domains are sought. Goals 3.1 and 3.3 are pursued through the various analysis opportunities that emerge in the assignment. Students aim to find: empirically sound studies; themes across studies; "take-home" messages from the synthesis of knowledge; adequate depth and breadth of content; a target audience; gaps in their own and their peers' artifacts, and more. They use their scientific understanding and critique skills to vet literature for translation and use. Often students selected a topic of personal relevance or of seeming practical relevance (e.g., diagnoses, interventions, treatments). Finding issues worth exploring and summarizing as well as an audience that will uptake that information helps develop students' values surrounding different communities' needs (Goal 3.3).

Opportunities to *evaluate* one's own and others' work are inherent to this assignment style. Reviewing, scoring, reflecting on, commenting on, and editorializing one's own, and a peer's, artifact are by-products of peer review. Student engagement increases when students are actively involved with asking questions, working collaboratively, and gauging understanding (Ahlfeldt et al., 2005). The quality of the artifacts themselves, student learning, personal values, and relationships (Goal 3.2) are advanced through peer review. Following time to reflect and revise the artifact (Goals 4.1, 4.2), students have another review-cycle opportunity through in-class review. Engagement can be enhanced by hearing answers to their own and other students' questions and responses (Collaço, 2017). Students reported the in-class review to be extremely helpful even if they did not submit their artifact for viewing. Exposure to their peers' work and the instructor's comments helped them compare and analyze their own ideas to refine their messages.

Students reported it both personally and professionally challenging to receive critical feedback during review which is consistent with the literature (e.g., Fong et al., 2016). Providing peer evaluations gave students an alternative lens to view their academic feedback which builds their communication (Goal 4) and professional development (Goal 5). One student mentioned that they "used to fall apart" after receiving feedback until they learned the value of it through the assignment steps and the resulting improvements. This example illustrates the support some students received with accomplishing Goal 5.2 where self-efficacy and emotion regulation

are expected. Feedback can be significantly impactful to some students' self-esteem (Young, 2010). Belief in oneself and personal obligation are also positively associated with student engagement (Schlenker et al., 2013). The evaluations by peers, the potential to present the artifact to the public and employers, and fostering research uptake were strengths students mentioned that seemed to increase their motivation, commitment, interest, and subsequent engagement with the material needed to complete the assignment.

The penultimate goal of the assignment is to *create* (produce new, original work; Armstrong, 2010) a novel KT artifact to use for the ultimate goals of learning outcome assessment, course grading, and professional development. Effective writing and presentation (Goals 4.1, 4.2) skills, applying "content and skills to [one's] career goals" (Goal 5.1) and developing "a meaningful professional direction for life after graduation" (Goal 5.5) are facilitated through the assignment regardless of choosing to publicly post the artifact or not. When students are allowed more control in their academic pursuits (such as choosing their topic, mode of delivery, and message in the current assignment) it positively influences their degree of engagement (Schlenker et al., 2013). Students tend to invest more in their academics when they perceive personal importance to them (Shell & Husman, 2001), an underlying theme throughout all steps of this assignment.

LIMITATIONS AND FUTURE DIRECTIONS

Some limitations exist that surround resources and student ability. Regarding resources, a repository is required, whether it be created or found elsewhere, that the public will learn about and begin to access. Effort to post on and maintain that repository also requires resources. Collaborations with libraries or other public dissemination forums already in existence may benefit the reach of artifacts to the public.

Student ability varied as expected for major assessments, but many needed some developmental support in applying their knowledge to make explicit recommendations. Although exceptional summaries and syntheses of concepts, terms, statistics, and results were provided, many struggled to generate actionable recommendations from that knowledge. Some artifacts were oversimplified or too complex for user-friendly public use. Students' *self-efficacy* (Goal 5.2) in their ability to make recommendations based on their expertise was somewhat lacking. Supporting the ability to identify usable, actionable research findings and effectively *communicate* (Goal 4) them in a recommendation format would facilitate accomplishment of these goals in future iterations.

No research data is yet available to support the observations and analysis outlined in this article. Future research may aim to examine indicators of engagement from both the students' and instructors' perspectives. Further, Goal 3.3 (social responsibility) could be enhanced in future iterations by adopting a community-engaged scholarship approach (e.g., see Warren et al., 2018) to identify real KT needs from communities and subsequently evaluating the implications of having those needs met.

CONCLUSION

Effective teaching methods often result in increased student engagement which tends to result in more positive learning outcomes (Troisi, 2014) and higher grades (Webber et al., 2013) for students. Students report greater satisfaction with their university experiences when they spend more *time* (how often students engage with material) and *effort* (how fully students engage in the learning activity; Webber et al., 2013) on their learning activities. Finding exciting, novel, yet meaningful means of completing university assessments such as this KT assignment improves student engagement, helps accomplish advanced learning outcomes, and a wide series of APA learning goals while serving the community by filling some of the knowledge-to-action gap.

COMPETING INTERESTS

The authors have no competing interests to declare.

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