Introducing the Effort-Benefit Framework: A Mimamsa-Inspired Approach to Defining Effective Learning Outcomes

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ABSTRACT

Bloom's taxonomy has been one of the most prevailing frameworks for writing the Learning outcomes (LO) of any educational program. However, this taxonomy was originally created to define Cognitive Learning outcomes and that is problematic for creative programs like design. The limitations of the taxonomy inspired us to search for alternate approaches for defining learning outcomes for design education.

This paper introduces the Effort-Benefit (E-B) Framework, a novel approach to defining learning outcomes inspired by the action-oriented principles of the Mimamsa school of Indian philosophy. The E-B Framework focuses on establishing explicit connections between specific learning efforts and their associated cognitive and affective benefits. To evaluate the framework's effectiveness, a comparative study was conducted with 24 design students and faculty members. Participants were given online forms in which they had to select their preference between two types of learning outcome statements, namely statements following Bloom's taxonomy and those following the E-B framework.

The results reveal a significant preference towards learning outcome statements based on the proposed E-B Framework as against the statements using Bloom's taxonomy. 78% of participants favored the E-B framework statements of learning outcomes in terms of being more meaningful to perceive, over the Bloom's Taxonomy alternative. The findings highlight the need for better alternatives to Bloom's taxonomy for defining learning outcomes in design education. An extension of the research will need to validate the framework across diverse disciplines and educational contexts. Its impact on learner engagement and performance is further required to be investigated.

Keywords - Design Education, Learning Outcomes, Effort and Benefit, Mimamsa Philosophy, Bloom's Taxonomy

1. Introduction

Learning outcomes which are a part of Outcome based approaches of education, have gained importance in higher education (Biggs & Tang, 2007).

Learning outcomes are important guiding statements for defining the expectations from a course of study in a formal education program. Progress on student abilities and skill gained over a course of learning is often formally traced using well defined learning outcomes.

Learning outcomes are written in the form of clear statements about abstract cognitive skills that a student will be able to perform at the end of a learning program. (Spady, 1994). Only on the basis of effective learning outcomes, Curriculum design, instruction planning and assessing student progress are materialized (Kennedy et al., 2006).

A widely adopted framework for designing learning outcomes in higher education has been The Bloom's Taxonomy, since its inception in 1956 (Bloom et al., 1956). The taxonomy composes educational objectives into a hierarchical order, progressing from lower-order to higher-order cognitive skills (Krathwohl, 2002). The Bloom's Taxonomy has faced criticism for its limitations as much as it has influenced educational practice to a great extant. One of its criticisms is that the hierarchical structure of the taxonomy does not adequately reflect the complex and iterative nature of the learning process (Furst, 1981). It is argued that the emphasis on cognition based, abstract, objectives may not align well with the creative, practiced-based nature of certain disciplines (Ormell, 1974). Since Design is such a practice based and creative discipline, use of Bloom's taxonomy in defining learning outcomes may be inadequate in the design context.

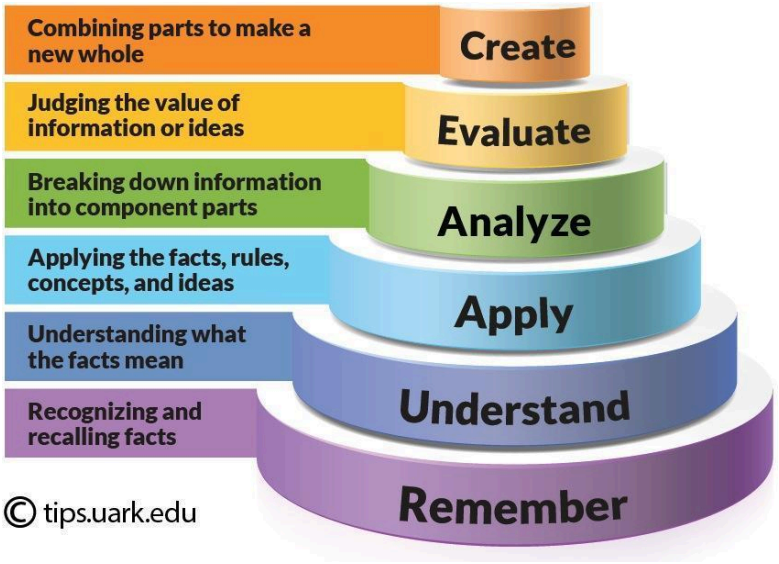

Fig 1: Hierarchy of learning outcomes organized in the Bloom's Taxonomy.(source: tips.uarl.edu)

Bloom's Taxonomy has several challenges and limitations that raise questions for its use in writing learning outcomes in Design Education:

- Bloom's Taxonomy arranges the learning outcome categories in a strict hierarchy from remembering to creation, assuming a linear progression of cognitive skills, which does not reflect the iterative nature of the human learning process (Furst, 1981).
- Abstract terminology of educational objectives can make it difficult for students to comprehend its meaning and may not be aligned with industry practices (Ormell, 1974).
- Bloom's taxonomy defines learning outcomes of cognitive domain which limits its scope in evaluating and formulating 'affective' and 'psychomotor' aspects of learning, which are crucial in practice-oriented fields like 'Design' (Bertucio, 2017).

- Noteworthily, Benjamin Bloom originally introduced two separate taxonomies for affective and psychomotor domain in his original book taxonomy of educational objective, however, only the bloom's taxonomy has seen widespread adaptation while the other two taxonomies have been neglected (Datt, 2021).

These limitations are particularly evident in design education, where learning is often project-based, collaborative, and focused on developing a mix of creative, technical, and interpersonal skills (Oxman, 1999). Design educators have long grappled with the challenge of articulating learning outcomes that capture the richness and complexity of design practice (Lawson & Dorst, 2009). Traditional academic frameworks like Bloom's Taxonomy may not adequately address the unique needs of design practice, leading to a disconnect between stated outcomes and the actual competencies required for success in the field.

Recognizing these challenges, this paper proposes an alternative approach to defining learning outcomes: the Effort-Benefit (E-B) Framework. The E-B Framework draws inspiration from the action-oriented epistemology of the Mimamsa school of Indian philosophy. Mimamsa scholars emphasize the close connection between prescribed actions and their intended outcomes, using conditional statements that link specific efforts to desired benefits (Chari, 1978).

Building on this principle, the E-B Framework defines learning outcomes using a structured format: "If you spend time doing [specific learning effort], you will be able to [specific learning benefit]." This approach aims to make explicit the connection between learning activities and their practical applications, highlighting the tangible value of learning efforts.

To evaluate the effectiveness of the E-B Framework in the context of design education, a comparative study was conducted with a sample of design students and faculty. Participants were presented with pairs of learning outcome statements for comparison, one using the E-B Framework and the other using Bloom's Taxonomy, and asked to select the one that they found more relevant and meaningful for the subject of the student in design. The study results, which will be discussed in detail in the following sections, indicate a significantly higher preference for the E-B Framework learning outcome statements over the statements based on the Bloom's Taxonomy.

This paper contributes to the ongoing discourse on learning outcomes in higher education by re-introducing a traditional approach that addresses some of the limitations of existing outcome-based education frameworks.

2. Mimamsa Philosophy and the E-B Framework

2.1. Mimamsa Philosophy and the E-B Framework

The Mimamsa school of Indian philosophy offers a unique perspective on the relationship between actions (kriya) and their outcomes (phala). One of the six orthodox schools of Hindu philosophy is Mimamsa, having focus on the interpretation of Vedic texts (Jha, 1942), which means "investigation" or "inquiry,". The idea of Dharma or duty is the core of mimamsa, which is described as a set of injunctions or actions prescribed by the Vedas for attaining or bringing about desired results or the desired heaven, in a metaphorical sense (Verpoorten, 1987).

The meaning of Vedic injunctions (vidhi) was analysed by the Mimamsa scholars to discern how Actions and Outcomes are related causally to each other. In this analysis the notion of kriya, or action, is the means to achieve a desired phala, or fruit (Chari, 1978). The terminology of Mimamsa makes use of conditional statements to state the relationship between action and outcome, that can be stated as "If you desire heaven, perform the Jyotistoma sacrifice" (Elisa Freschi, Andrew Ollett & Matteo Pascucci, 2019).

The Mimamsa method of action lays the foundation of the right procedure and intention in achieving the ‘expected outcomes’. An action is effective, if it is performed in alignment with the prescribed rules and with the appropriate mental disposition (Francavilla, 2006). The impacts of unseen factors (adrishta) are also recognized in Mimamsa, in the manifestation of action-outcome relationships, understanding that the ultimate fruits of one's actions may not be always immediately apparent (Kumar, 2000).

One of the significant principles in Mimamsa is the notion of codana, or injunction, which is seen as the primary means of understanding dharma. Similar to the vedic, value ethics, injunctions refer to the prescriptive and suggestive statements in The Vedic texts that guide individuals towards right actions that spontaneously produce specific effects (Jha, 1942). It is the impacts of unseen factors (adrishta) relieved by Mimamsa philosophers that these injunctions have an internally motivating force, encouraging individuals to act in accordance with their prescriptions to obtain the desired ends (Verpoorten, 1987).

Taking inspiration from the Mimamsa injunction structure, we asked, how will the learning outcomes be perceived and understood by students and faculty members of design, if the learning outcomes follow the structure of Mimamsa based injunction. Hence, we developed the E-B Framework to adapt the Mimamsa action-outcome framework in the context of defining learning outcomes for a course in communication design. Similar to the Vedic injunctions that are prescribed using specific actions for attaining desired results, learning outcomes in the E-B Framework specify the effort or work required to achieve desired educational benefits. The new framework of learning outcomes, stresses upon the value of clearly articulating the connection between learning activities and their intended cognitive and affective benefits, by following the Mimamsa attention on the performance of prescribed actions to re-generate specific desirable learning goals (figure 2).

Fig 2: Causal Relationship between human effort and the resulting benefit. (Author's interpretation)

The E-B Framework explores a new perspective on the construction and evaluation of learning outcomes in design education. While taking inspiration from the action-oriented epistemology of Mimamsa

It may be clarified that this is a selective adaptation of certain principles of the Mimamsa philosophy and not a direct application of the entire Mimamsa system. The new framework does not claim to represent the full complexity of Mimamsa thought but only draws inspiration from its action-outcome injunction structure to address specific limitations in outcome based education practice.

3. Applying the E-B Framework in Design Education

To illustrate the application of the E-B Framework, consider the following examples of learning outcomes defined for a course in design:

E-B Framework:

"If you analyse user needs and iterate on prototypes, you will be able to create user interfaces that are intuitive and easy to use for the defined user."

Bloom's Taxonomy:

"By the end of this course, students will be able to design user interfaces that meet specified usability criteria."

The E-B Framework version connects specific learning activities (user needs analysis, prototyping) to a concrete learning benefit (creating intuitive and easy to use interfaces). In contrast, the Bloom's Taxonomy version focuses on an abstract capability defined by educational criteria.

Other examples of E-B Framework learning outcomes for design could include:

- " If you learn about color harmonies, then you will be able to create designs with appropriate color combinations that has a positive aesthetic effect on the viewer."

- " If you learn about Trekking and Kerning, you will be able to create typographic layouts that are clear and easy to read by the viewer."

These outcomes provide a rationale for the learners to invest effort, while also offering clues on learning specific activities and concepts that will lead to success.

3.1. Validation through survey

To evaluate the perception of the E-B Framework for design students and faculty members, in comparison to Bloom's Taxonomy, a study was conducted with a sample of 24 design students and faculty. Participants were presented with pairs of learning outcome statements, using the E-B Framework and using traditional Bloom's Taxonomy verbs. For each pair, participants were asked to select the statement that made more sense for them in relation to their course of study.

4. Comparing the perceived meaningfulness of Bloom's Taxonomy with Mimamsa-Style Learning Outcomes in Design Education

Aim

The aim of this study was to compare the ‘perceived’ meaningfulness of learning outcomes defined using Bloom's Taxonomy against those defined using the Mimamsa-inspired Effort-Benefit (E-B) Framework in the context of design education.

Objectives

1. To compare a set of paired learning outcome statements for design courses, with one statement using Bloom's Taxonomy and the other using the E-B Framework.

2. To collect data about the preferences of design students and faculty for the two distinct types of learning outcome statements.

3. To compare the data to determine if there is a significant difference in the perceived effectiveness of the two types of learning outcomes.

Methodology

Participants

The study involved a sample of 24 participants, consisting of 16 design students and 8 design faculty members from a university in Gurugram. The sampling of participants was done using convenience sampling, selecting those who voluntarily agreed to take part in the study. The student responses were free from bias towards one type of learning outcome statements or the other because the students participating in the study did not have prior knowledge of Bloom’s taxonomy action verbs terminology.

Materials

Four pairs of learning outcome statements representing common outcomes in a graphic design course were part of a questionnaire developed. Each pair consisted of one statement using Bloom's Taxonomy and another using the E-B Framework. Google forms were used to present the questions to student and

faculty participants of the study to collect their response able choice of one type of learning outcome statements. Qualitative feedback on the choices was also collected.

Examples of the learning outcome pairs used in the questionnaire:

Pair 1:

A. (Bloom's Taxonomy) At the end of the course, students will be able to recall the names of different color harmonies and the specific colors associated with them.

B. (E-B Framework) If you learn about color harmonies, then you will be able to create colour palettes with distinct and consistent design language ot be used in branding related designs.

Pair 2:

A. (Bloom's Taxonomy) At the end of the course, students will be able to change the tracking and kerning of typographic text.

B. (E-B Framework) If you learn about tracking and kerning, you will be able to create typographic layouts that give clarity and easy readability to the viewer.

Procedure

A questionnaire was administered online using Google Forms. Participants were provided with an email link to the questionnaire and could complete it at their convenience. The responses were automatically collected and stored in a spreadsheet for analysis.

Data Collection

The data collected consisted of the participants' selections for each pair of learning outcome statements (A or B) and their qualitative feedback. The data was organized in a spreadsheet, with each row representing a participant and each column representing a learning outcome pair.

Results and Analysis

Quantitative Analysis

The data was analyzed using a chi-squared test to determine if there was a significant difference in the preferences for Bloom's Taxonomy versus E-B Framework learning outcomes. The results showed that out of the 96 total responses (24 participants × 4 pairs), 75 (78%) favored the E-B Framework (mimamsa style) statements, while 21 (22%) favored Bloom's Taxonomy statements.

Table 1: Comparison of responses against two type of Learning Outcomes Source: Author

Learning Outcome Type	***Number of Responses***	***Percentage***
E-B Framework	75	78%
Bloom's Taxonomy	21	22%
Total	96	100%

The data shows that out of the 96 total responses (24 participants × 4 pairs of learning outcomes):

- 75 responses (78%) favored the E-B Framework learning outcomes
- 21 responses (22%) favored the Bloom's Taxonomy learning outcomes

The chi-squared test yielded a value of $\chi 2(1, N = 96) = 26.04$, $p < .001$, indicating a statistically significant preference for the E-B Framework learning outcomes over those based on Bloom's Taxonomy.

5. Conclusion

The results of this study indicate that design students and faculty meaningfully perceive learning outcomes defined using the Mimamsa-inspired Effort-Benefit Frameworks compared to Bloom's. The E-B Framework statements were perceived as more meaningful and understandable, providing a stronger connection between learner's efforts and the outcomes that can be expected by the learner.

We do not intend to suggest a replacement of Bloom's taxonomy learning outcome with E-B framework statements. Bloom's taxonomy learning outcome is an extremely useful tool for helping students know the future outcomes they can expect to achieve at the end of a course of study..

However, it does not outline the process or effort by which the desirable outcomes can be achieved. The E_B framework is a manual for the design faculty members that can help them define tasks and activities (Efforts) that enable students to achieve desired learning outcomes (Benefits).

By causally connecting specified learning activities to their observable outcomes, the taxonomy structure can enable design educators not only to develop appropriate learning goals, but also define the technical pathway to achieving those goals.

However, one of the main limitations of this study is the limited sample size and data on only a single design institution and discipline. Further research is required to validate the findings across different design domains, cultural contexts, and educational levels of the participants. Extended research can potentially explore the effect of E-B Framework learning outcomes on changes in students' performance on remembering, understanding, application, analysis, evaluation and creation related learning tasks.

The Effort-Benefit Framework draws upon the action-outcome oriented epistemology of Mimamsa philosophy to define learning outcomes that directly connect learning efforts to learning benefits that can be both cognitive and effective and even psychomotor(not discussed here). This approach addresses key limitations of Bloom's Taxonomy, enhancing the relevance and meaningfulness of learning outcomes as shown in the current ongoing study.

Future work aims to test the findings by replicating them in diverse domains of design and other disciplines, explore the impact of the E-B Framework on learner engagement and more importantly, performance, and develop tools to support its integration into curriculum design.

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