

# **A Systems Engineering Approach to Defining and Assessing Teaching Effectiveness in Higher Education**

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## **Abstract**

The assessment of teaching effectiveness in higher education continues to be a somewhat hit or miss exercise. Many higher education institutions use summative instructor rating assessment systems however the depth of knowledge gained from the assessments along with the implementation of the gained knowledge is highly variable. There exists a need for an assessment approach that is both formative and summative. This paper utilizes a Systems Engineering development approach to designing a teaching effectiveness assessment methodology at higher education institutions. By utilizing the Systems Development Life cycle, this research identifies the key stakeholders of the teaching effectiveness system, and utilizes Joint Application Design (JAD) sessions with these stakeholders to identify and define the components of the system. This definition underpins the development of the assessment methodology and allows the aligning of the assessment methodology.

## **I. Background**

What is teaching effectiveness and what does it look like? This is a pivotal question to the study as it dictates the direction of the research. In order to assess teaching effectiveness the inevitable question of what defines teaching effectiveness must be considered <sup>[1]</sup>. The literature is replete with the application of measures and methods for evaluating teaching effectiveness yet a concrete definition of what constitutes effective teaching in higher education is far less forthcoming. Teachers often feel frustration while undergoing assessment of their effectiveness without a proper definition <sup>[1]</sup>. To define teaching effectiveness in higher education there must first be an understanding of the teaching environment, including the actors and their associated roles.

As displayed in Fig. 1, the main actors in the current instructional environment are, in no particular order, the students, the professors, the department chairs, the academic deans, the accreditation bodies, the students' employers and the university's administration and Human Resource Department. The teachers create instruction that is provided to students. Instructional development is the process by which instruction is developed to meet a set of criteria. As shown in Fig. 1, the instruction developed by teachers is evaluated by students, academic peers, department chairs, industry and accreditation bodies. Although instructional development for teachers has become an important topic in higher education, little is known about the impact it has on daily teaching practice <sup>[2]</sup>.



evaluation in the United States <sup>[8]</sup>. However, practices in applying the results of student ratings have not been based upon a sound statistical foundation <sup>[9]</sup>. Student ratings, however, tend to be summative in nature, occurring at the end of a semester, thus not providing for adjustment to instruction by teachers. Additionally, these student surveys are mainly used for promotion and tenure decisions but have little bearing on instructional design and implementation.

Peer evaluation can be an effective assessment method, however, teachers often lack the motivation to assess their peers' work faithfully and fairly <sup>[10]</sup>. Because teachers are seen as a fraternity, teachers are often loathe to provide negative reviews of their peers. Peer review typically involves subjective assessment of teaching performance via in-class observations and recordings of class sessions, and the less subjective review of instructional materials.

Department chairs and deans typically possess greater faith in the validity and utility of student evaluations of teaching than do faculty <sup>[11]</sup>. Administrator ratings are typically based on secondary sources and not on direct observation of teaching or any other area of perspective <sup>[4]</sup>. Administrators, however, make decisions regarding the academic careers of teachers, specifically in terms of tenure decisions. Tenure is typically granted after a teacher or researcher has successfully completed a probationary period and performed with adequate distinction, as defined by the relevant institution <sup>[6]</sup>. This definition of adequate distinction however, is largely ambiguous at many institutions. Furthermore, policies, procedures, and criteria for the evaluation of teaching in higher education contribute to the marginalization of teaching within the reward structures of universities and colleges <sup>[5]</sup>. Many institutions unintentionally marginalize teaching by over-emphasizing scholarly research and funding. When this occurs, oddly enough, teaching becomes less important to teachers who seek the security of tenured positions. Instead, teachers focus on scholarly research and publications as well as grant writing to increase research funding and thus status in their departments.

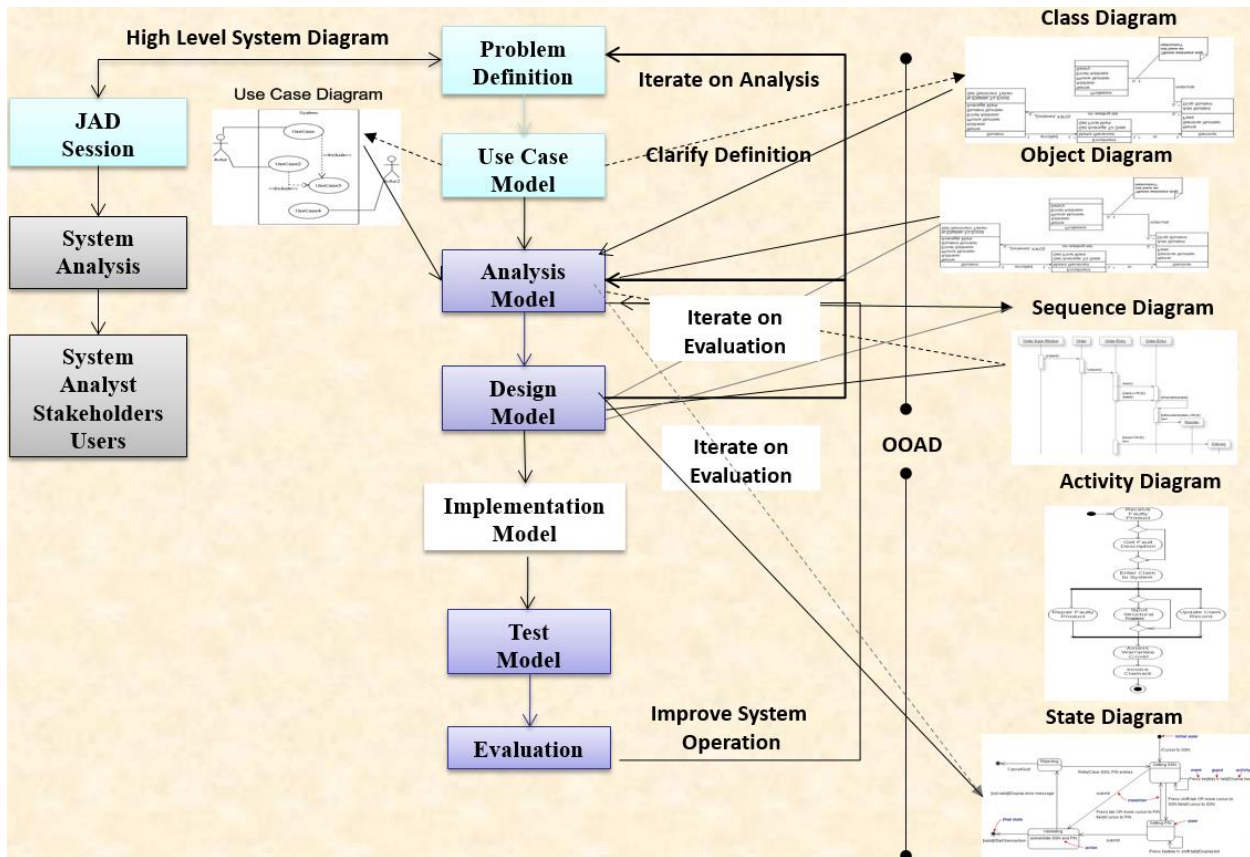
Students' industry employers evaluate teaching by providing input through joint committees comprising faculty, administration and industry professionals. The industry professionals provide the faculty and administration with key insight into specific learning needs as well as common deficiencies that are addressed by staff training and development. These insights are used by the faculty and administration to determine elective classes that should be offered, as well as to provide input into the instructional development process for core and elective classes.

Accreditation bodies evaluate academic programs with thorough, rigorous criteria. These criteria include the students, the educational objectives of the program, the student outcomes, the curriculum, the faculty and the facilities. The overall competence of the faculty may be judged by teaching effectiveness <sup>[12]</sup>.

## II. Systems Engineering Methodology

As shown in Fig. 2, the Systems Development Lifecycle (SDLC) moves from problem definition to evaluation in an iterative fashion, producing different types of artifacts along the way. In order to solve a complex problem such as the definition and assessment of teaching effectiveness, the problem definition phase of the SDLC is critical.

The system is first conceptualized at a high level of abstraction based on a review of the literature in order to determine the stakeholders. The stakeholders and their roles are shown in Fig. 1. After determining the stakeholders, Joint Application Design (JAD) sessions are used to collect information from them regarding the systems' requirements. The JAD sessions rely on the use of conceptual structures to encourage and elucidate the thoughts of the stakeholders and argumentative design rationale to capture the thinking behind the decisions made. These requirements are used to design, implement and test models of the definition and assessment of teaching effectiveness.



**Figure 2.** Systems Development Lifecycle

### III. In-Progress Work

This paper represents an in-progress research study that has two main points of emphasis; defining teaching effectiveness and assessing teaching effectiveness.

#### A. Defining Teaching Effectiveness

Research is currently being performed to create focus groups including representatives of all the stakeholders to gather data via JAD sessions. The literature is being reviewed to provide impetus to the elicitation of requirements from the stakeholders by using conceptual structure models to represent data at high levels of abstraction. Argumentative design rationale schemas are also currently being reviewed to determine a best fit for capturing the design rationale used in

decision-making during the JAD sessions. The deliverable from the JAD sessions will be a definition of how, at each level of evaluation, by each stakeholder, effective teaching is being defined.

#### B. Assessing Teaching Effectiveness

Once the teaching effectiveness is defined, further JAD sessions with the stakeholders, along with best practices from the literature will provide metrics regarding how the teaching effectiveness should be assessed. The assessment procedures and instrumentation will also be developed in alignment with the definitions of effective teaching for each stakeholder. Barriers to the implementation of current assessment of teaching effectiveness along with potential barriers to the developed assessment procedures and instrumentation will also be addressed via the JAD sessions and a review of the literature.

#### IV. Conclusion

Though the research is still in-progress, the literature has shown that there is a need for teachers to understand what effective teaching means to each of their stakeholders, and to know how this understanding translates to their assessment by their stakeholders

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