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CONSTRUCTIVELY ALIGNED INSTRUCTIONAL DESIGN FOR ORAL PRESENTATIONS

James Lipuma[1]
Cristo León[2]
Jose Ernesto Malpica Rosendo[3]

ABSTRACT

In the paper "Constructively Aligned Instructional Design for Oral Presentations," the authors explore the implementation and outcomes of the 'General, Particular Specific' (GPS) model as a framework for curriculum instructional design for oral presentations within STEM education at an R1 Polytechnic University.

Objective: This study aims to investigate the impact of the 'General, Particular Specific' (GPS) model on the enhancement of constructive alignment in curriculum instructional design for oral presentations in STEM education to improve students' oral communication skills and their effectiveness in technical communication.

Theoretical Framework: Constructive alignment, curriculum-based Assessment, and curriculum and instructional design stand out, providing a solid basis for understanding the context of the investigation. The literature includes foundational texts on marketing management, center-based engineering research, Bloom's taxonomy of educational objectives, and the principles of enhancing teaching through constructive alignment. Additionally, it acknowledges the multifaceted nature of instructional design, emphasizing the widespread adoption of the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), showcasing a structured, comprehensive approach to educational planning and execution.

Method: The methodology adopted for this research comprises a qualitative study design, utilizing case study approaches within the Humanities and Social Science department at an R1 Polytechnic University. Data was collected through classroom observations, instructor interviews, and analysis of student presentation outcomes before and after implementing the GPS model.

Results and Discussion: The results revealed significant improvements in students' abilities to think critically about content alignment with audience expectations and effectively communicate technical information. In the discussion section, these results are contextualized in light of the theoretical framework, underscoring the effectiveness of the GPS model in fostering clear, explicit instruction and scaffolding in oral presentation skills. The study acknowledges possible limitations, including its scope within a single institution and the need for broader empirical validation.

Research Implications: This research's practical and theoretical implications are discussed, providing insights into how the results can be applied or influence practices in STEM education. These implications could encompass curriculum development, pedagogical strategies, and enhancing communication skills in STEM fields.

Originality/Value: This study contributes to the literature by highlighting the originality of applying the GPS model within the context of oral presentation instruction, marking a significant shift from traditional, less structured approaches to a more scaffolded and constructively aligned methodology. The relevance and value of this research are evidenced by its potential to impact pedagogical practices, particularly in enhancing the oral presentation capabilities of STEM students, thereby addressing a critical gap in STEM education and communication training.

[1] New Jersey Institute of Technology, Newark, New Jersey, USA.
E-mail: lipuma@njit.edu Orcid: https://orcid.org/0000-0002-9778-3843
[2] New Jersey Institute of Technology, Newark, New Jersey, USA.
E-mail: leonc@njit.edu Orcid: https://orcid.org/0000-0002-0930-0179
[3] Colegio Preparatorio Vespertino de Xalapa, Xalapa, Veracruz, México.
E-mail: zS17000529@estudiantes.uv.mx Orcid: https://orcid.org/0009-0008-5003-4619

Keywords: Constructive Alignment, STEM Education, Inclusive Education, Gender Equality in STEM, Critical Thinking, SDG4 (Sustainable Development Goal 4).

DESIGN INSTRUCIONAL CONSTRUTIVAMENTE ALINHADO PARA APRESENTAÇÕES ORAIS

RESUMO

No artigo "Construtively Aligned Instructional Design for Oral Presentations" (Projeto Instrucional Alinhado Construtivamente para Apresentações Orais), os autores exploram a implementação e os resultados do modelo "General, Particular Specific" (GPS) como uma estrutura para o projeto educacional curricular para apresentações orais dentro da educação CTEM em uma Universidade Politécnica R1.

Objetivo: Este estudo tem como objetivo investigar o impacto do modelo "Geral, Particular Específico" (GPS) na melhoria do alinhamento construtivo no projeto educacional curricular para apresentações orais na educação CTEM para melhorar as habilidades de comunicação oral dos alunos e sua eficácia na comunicação técnica.

Estrutura Teórica: Alinhamento construtivo, Avaliação baseada em currículo e design curricular e instrucional se destacam, fornecendo uma base sólida para a compreensão do contexto da investigação. A literatura inclui textos fundamentais sobre gestão de marketing, pesquisa de engenharia centralizada, taxonomia de objetivos educacionais de Bloom e os princípios de aprimoramento do ensino através de alinhamento construtivo. Além disso, reconhece a natureza multifacetada do design instrucional, enfatizando a ampla adoção do modelo ADDIE (Análise, Design, Desenvolvimento, Implementação e Avaliação), apresentando uma abordagem estruturada e abrangente para o planejamento e a execução educacional.

Método: A metodologia adotada para esta pesquisa compreende um projeto de estudo qualitativo, utilizando abordagens de estudo de caso dentro do departamento de Humanidades e Ciências Sociais em uma Universidade Politécnica R1. Os dados foram coletados por meio de observações em sala de aula, entrevistas com instrutores e análise dos resultados da apresentação do aluno antes e depois da implementação do modelo GPS.

Resultados e discussão: os resultados revelaram melhorias significativas nas habilidades dos alunos para pensar criticamente sobre o alinhamento do conteúdo com as expectativas do público e comunicar informações técnicas de forma eficaz. Na seção de discussão, esses resultados são contextualizados à luz do quadro teórico, ressaltando a eficácia do modelo GPS na promoção de instruções claras e explícitas e andaimes em habilidades de apresentação oral. O estudo reconhece possíveis limitações, incluindo o seu âmbito dentro de uma única instituição e a necessidade de uma validação empírica mais ampla.

Implicações da pesquisa: As implicações práticas e teóricas desta pesquisa são discutidas, fornecendo insights sobre como os resultados podem ser aplicados ou influenciar práticas na educação em CTEM. Estas implicações poderão abranger o desenvolvimento curricular, as estratégias pedagógicas e o reforço das competências de comunicação nos domínios das CTEM.

Originalidade/valor: Este estudo contribui para a literatura, destacando a originalidade da aplicação do modelo GPS no contexto da instrução de apresentação oral, marcando uma mudança significativa das abordagens tradicionais, menos estruturadas, para uma metodologia mais estruturada e construtivamente alinhada. A relevância e o valor desta pesquisa são evidenciados por seu potencial para impactar práticas pedagógicas, particularmente no aprimoramento das capacidades de apresentação oral dos alunos de CTEM, abordando, assim, uma lacuna crítica na educação em CTEM e na formação em comunicação.

Keywords: Alinhamento Construtivo, Educação em CTEM, Educação Inclusiva, Igualdade de Gênero em CTEM, Pensamento Crítico, ODS4 (Objetivo de Desenvolvimento Sustentável 4).

DISEÑO INSTRUCCIONAL ALINEADO CONSTRUCTIVAMENTE PARA PRESENTACIONES ORALES

RESUMEN

En el artículo "Diseño instruccional alineado constructivamente para presentaciones orales", los autores exploran la implementación y los resultados del modelo 'General, Particular Específico' (GPS) como un marco para el diseño

instruccional del plan de estudios para presentaciones orales dentro de la educación STEM en una Universidad Politécnica R1.

Objetivo: Este estudio tiene como objetivo investigar el impacto del modelo 'General, Particular Específico' (GPS) en la mejora de la alineación constructiva en el diseño instruccional del plan de estudios para presentaciones orales en educación STEM para mejorar las habilidades de comunicación oral de los estudiantes y su efectividad en la comunicación técnica.

Marco teórico: Se destacan la alineación constructiva, la evaluación basada en el currículo y el diseño curricular e instruccional, proporcionando una base sólida para comprender el contexto de la investigación. La literatura incluye textos fundacionales sobre gestión de marketing, investigación de ingeniería basada en centros, la taxonomía de Bloom de objetivos educativos y los principios de mejorar la enseñanza a través de la alineación constructiva. Además, reconoce la naturaleza multifacética del diseño instruccional, enfatizando la adopción generalizada del modelo ADDIE (Análisis, Diseño, Desarrollo, Implementación y Evaluación), mostrando un enfoque estructurado e integral para la planificación y ejecución educativa.

Método: La metodología adoptada para esta investigación comprende un diseño de estudio cualitativo, utilizando enfoques de estudio de caso dentro del departamento de Humanidades y Ciencias Sociales en una Universidad Politécnica R1. Los datos se recopilaron a través de observaciones en el aula, entrevistas con instructores y análisis de los resultados de la presentación de los estudiantes antes y después de implementar el modelo GPS.

Resultados y discusión: Los resultados revelaron mejoras significativas en las habilidades de los estudiantes para pensar críticamente sobre la alineación del contenido con las expectativas de la audiencia y comunicar efectivamente la información técnica. En la sección de discusión, estos resultados se contextualizan a la luz del marco teórico, subrayando la efectividad del modelo GPS para fomentar la instrucción clara y explícita y el andamiaje en las habilidades de presentación oral. El estudio reconoce posibles limitaciones, incluido su alcance dentro de una sola institución y la necesidad de una validación empírica más amplia.

Implicaciones de la investigación: Se discuten las implicaciones prácticas y teóricas de esta investigación, proporcionando información sobre cómo se pueden aplicar los resultados o influir en las prácticas en la educación STEM. Estas implicaciones podrían abarcar el desarrollo del currículo, estrategias pedagógicas y mejorar las habilidades de comunicación en los campos STEM.

Originalidad/Valor: Este estudio contribuye a la literatura al resaltar la originalidad de aplicar el modelo GPS en el contexto de la instrucción de presentación oral, marcando un cambio significativo de los enfoques tradicionales menos estructurados a una metodología más andamiada y alineada constructivamente. La relevancia y el valor de esta investigación se evidencian por su potencial para impactar las prácticas pedagógicas, particularmente en la mejora de las capacidades de presentación oral de los estudiantes STEM, abordando así una brecha crítica en la educación STEM y la formación en comunicación.

Palabras clave: Alineamiento Constructivo, Educación STEM, Educación Inclusiva, Igualdad de Género en STEM, Pensamiento Crítico, ODS4 (Objetivo de Desarrollo Sostenible 4).

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1 INTRODUCTION

Communication is essential in all career paths, but many STEM students discount the value of and avoid practice rather than embrace the need to improve this transferable essential skill and its importance on employability (McGunagle & Zizka, 2020). Employers stress the need for workers who are effective oral communicators, and most programs assign oral

presentations and reports as part of the curriculum. Interviews and job activities highlight the need for this skill at all levels. Students specializing in the hard sciences tend to neglect natural modes of communication, preferring to develop niche literate skills such as mathematical proficiency or programming. This focus on specialized competencies allows for narrow peer-to-peer communication within their fields but overlooks the broader importance of versatile communication skills. This imbalance is partly attributed to an educational culture that emphasizes technical skill acquisition at the expense of comprehensive communicative development. Additionally, the challenges in proficiently utilizing communication tools can be linked to the educational dynamics between students and mentors within the science disciplines. These mentor-student interactions are pivotal to developing both the personal and professional competencies of STEM students, suggesting a collaborative approach is necessary to improve communication skills within STEM education, aiming for a balanced development of future scientists and engineers (Ribes et al., 1996). Yet, there is a notable gap in research on designing effective instructional strategies and assignments that enhance communication skills in STEM fields. Furthermore, there is often a scarcity of explicit instruction on these skills or effective examples. "The lack of explicit instructions in scientific inquiry skills is a major factor in low STEM retention and academic underperformance" (Feldon et al., 2010). Often, it is assumed that students have already been taught the skills needed to understand an assignment, design an effective means for conveying a core message, and understand how to judge the scenario and goals aligned with the needs of the content and supporting materials. Though this is often not the case, the support and feedback, if any is provided, cannot do more than refine the content delivery for a narrow situation in which the instructor generalizes without providing the means to understand and apply the feedback to future tasks within the same class, other classes in the curriculum, or future needs within the field. Students need to have clear, explicit instruction and emphasis on a scaffolded, constructively aligned system for approaching oral presentations that begin with the student's current level and allow them to learn how to approach any scenario to integrate content with delivery to attain their goal of conveying their core message to the desired target audience within the prescribed scenario. This article presents a background of the "General Particular Specific (GPS) model" and how it was used to develop constructively aligned tasks to teach oral presentations (Lipuma & León, 2020) and to conduct a systematic literature review.

This paper aims to explain the elements of the curriculum instructional design that benefited from using the GPS model to enhance constructive alignment. It starts with a theoretical framework and basic definitions for the present discussion. It follows with a

background of the context. Then, the article describes the steps followed for developing instructions for effective oral presentations, leading to a description of the GPS model. This is followed by a real-world example of its use in teaching effective oral presentation design and the author's rationale for using the GPS model as a constructive alignment. Finally, the authors discuss the results of its use and conclude with limitations, next steps, and final thoughts.

1.1 THEORETICAL FRAMEWORK

The following literature consolidates the theoretical framework recommended for everyone interested in oral presentation and education: (Anderson et al., 2001; Biggs, 1996; Frey, 2018; Kotler & Keller, 2015; National Academies of Sciences et al., 2020; National Academy of Sciences et al., 2017; National Research Council, 2012).

1.2 BASIC DEFINITIONS

The significance of effective teaching and learning strategies cannot be overstated in education, particularly in STEM fields. As we delve into the foundational elements that shape the educational experience, we must understand critical concepts that drive instructional design and Assessment. This section, "1.2 Basic Definitions," introduces critical terminologies that underpin the framework of our discussion on constructively aligned instructional design for oral presentations.

Curriculum-Based Assessment (CBA) "Because of its foundation in relevant educational practice, CBA can be a handy tool in student evaluation and instructional decisions within a problem-solving framework" (Shulman, 2004, p. 447).

Curriculum and Instructional Design (CID) encompasses the areas that deal with the organization of content to be taught and the structure of methods and supports to accomplish that teaching. The curriculum describes those activities at a more extensive scope, while instructional design deals with the planning and execution closer to the interaction with learners.

Constructive Alignment (CA) is the idea that the content, Pedagogical Content Knowledge (PCK), methods of instruction and delivery, and assessments must all connect and reinforce one another. The CA provides a clear plan and a coherent path for learning aligned with the PCK. Additionally, the concepts being taught are reinforced for learners. Finally, it gives a picture of prior and future knowledge (Biggs, 1996; Lipuma & León, 2020; Shulman, 2004).

The General Particular Specific (GPS) model is a deductive analytical tool designed to assist presenters in pre-planning and planning their oral presentations in diverse situations and contexts. The GPS model's structure can help students maintain focus on the purpose of the presentation by creating the broad topical categories of "General," "Particular," and finally, "Specific".

The Universal Strategic Planning (USP) Model was designed to assist researchers or a research team with a tool to collaborate and communicate with different stakeholders and audiences from organizations and associations, both public and private. The Model will create a graphic organizer similar to a logic model diagram with two added dimensions: Pre-planning and Assessment.

The production model: prepare, perform, publish (P3 model)[4] was designed to help students understand the activities typically encountered in oral presentations and the steps needed to create effective presentations and attain the desired target in a given situation.

2 BACKGROUND

Numerous models and methods for specific applications of oral presentations have been put forth in different scenarios across educational situations. [*blinded for peer-review*] and [*blinded for peer-review*] developed the 'General, Particular, Specific' or GPS model in 2004 as a model to facilitate student presentations for STEM prototyping in the "Centro de Bachillerato Technologic: industrial y de servicios No. 13 (CBTis)" a technical high school in Xalapa, Ver Mexico. It was a fundamental model for the "Dirección General de Educación Tecnológica Industrial y de Servicios (DGETI)" from 2004 to 2010. It was implemented at the state, national, and international competitions for prototypes and entrepreneurs. The Model was then implemented in continual education courses for the "Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM)" from 2010 to 2015 as a model for oral presentations in the context of business and marketing research presentations. Finally, in collaboration with the "Collaborative for Leadership, Education, and Assessment Research (CLEAR)" at the New Jersey Institute of Technology (NJIT), the Model has been put into practice as a tool to improve the communication of undergraduate students and the presentations of academic research posters at the university for graduate students and researchers.

[4] *James Lipuma's blog*, Jul. 21, 2020. Soruce: https://www.jameslipuma.com/presentation- prepare-perform-publish-p3-model- introduction/.

This paper explores using the GPS model as a deductive analysis tool to assist presenters in pre-planning and planning their oral presentations in diverse situations and contexts. In this way, the learner has a more straightforward way of structuring their ideas and the expert content. In addition, this scaffolding can be applied to how the instructional materials are presented and the assignment described, allowing the students to see the alignment more fully. As students experience the common language provided by the GPS model, the instructional support for effective presentation can move beyond simply adequate content coverage or clear speaking to a higher level of discussion around effective integrated presentations. The research conducted on this instructional method is based on "Constructive Alignment" (Biggs, 1996), which describes how the learning objectives, instructional materials, and assessments should be aligned to increase their effectiveness. Integral to this approach is the incorporation of behavioral learning objectives, which serve to harmonize the proposed competency logic with the anticipated outcomes. A behavioral learning objective is delineated by competencies and contextualized within an event; it is defined by the manifestation of behavior in a given situation and by the outputs relevant to the activity. This inclusion ensures that instructional design not only aligns with educational goals but also with the practical demonstration of learned skills and knowledge in real-world scenarios. This constructive alignment of these aspects of the learning process tied to the curriculum and instructional design allows learners a clearer picture of the path. It enhances the benefit provided by clear feedback and formative Assessment. The GPS model provides a common language across disciplines so that students can understand their work, comment upon the work of others, plan more effectively, and have a baseline for discussion and critical analysis of both contents and how they are presented. This Model accommodates a diversity of tools and outputs—including graphs, academic content, multimedia formats, user interfaces (whether traditional or digital), and the final product—which are integral to assessing the synchronicity and effectiveness of the Model. This comprehensive approach not only fosters a deeper understanding among students but also enhances their ability to apply these concepts in real-world contexts. As we transition into the next section, the integration of these varied facets within the GPS model's comprehensive framework becomes apparent, guiding the development of instructional strategies that effectively captivate and educate, thus preparing students to thrive in their oral communication pursuits.

3 DEVELOPING INSTRUCTIONS FOR EFFECTIVE ORAL PRESENTATIONS

Over time, the authors have explored the problem of teaching students to present effectively. Initially, a survey of assessments and rubrics paired with a series of literature reviews was undertaken to identify best practices. This was followed by the development of the article "Curriculum Instructional Design: Critical Learning Path and Constructive Alignment" (Lipuma & León, 2020). It led to materials focused on the components of effective oral presentations. Though helpful, this revealed other problems related to student understanding, preparation, and level of sophistication. This led to the creation of the "Prepare, Perform, Publish (P3) model" (Lipuma & Yáñez León, 2020) and "Production model perspective" that adopts the aspects of film and theater to describe the presentation as a performance that requires planning and preparation before the moment of delivery as well as work to understand areas that exist afterward tied to post-production and performance improvement. With the needed instructional materials, support, and a model to drive student awareness regarding the planning phases, a new problem was revealed. Students could apply the tools when given focused content to cover or when refining aspects of delivery identified by the educator or experts. However, without feedback to lead them, many presenters defaulted back to content coverage, repeating what sources wrote or emulating lecture-style reporting of facts and details. This highlighted the need for students to understand the elements of scenario planning and how it is tied to a "Universal Strategic Planning (USP) model". Adding these elements to the instructional design and support assisted the constructive alignment and enhanced student understanding and overall quality of the work. With all of this in place, the current problem being addressed is the need for students to digest content and present it effectively to diverse target audiences. The researcher's current work concerns the disconnect between integrated presentation and the need to plan a coherent storyline. Despite clear assignment descriptions aligned with the instructional materials and assessments, students still needed support for planning content matched with different rhetorical situations dictated by the scenario. Shifting the onus from the instructor micromanaging the oral presentation toward the student taking ownership of what is to be presented led to a significant shift in what is described and assessed. Working to make the tools and models more universal meant that a model for content delineation and organization needed to be represented in ways those students could use them to plan and perform their oral presentations. Though many types and styles of presentations exist, a descriptive reporting sequence is a good starting point in written and oral presentations for a wide range of disciplines and classes. It allows instructors to define a general space and limit or expand the scope as

desired. At the same time, how content is categorized and correlated is determined by the subject matter and parameters set by instructors and programs. To accomplish this support for the students, the GPS model has been adopted so that students can have a "backbone" to build a simple storyline and add in needed signposting and support within any given scenario. Bringing all these components together will provide students with an easier way of starting any oral presentation and a more precise mechanism for demonstrating an understanding of content and their ability to present. Essential to any basic research competency is the foundation of literacy—reading and writing—and various modes of action, such as speaking and doing. In this context, the demonstrable expertise of instructors is indispensable; we can only impart a competency if it is effectively taught. The standard models provide educators with a list of criteria for both content and delivery that may be used at very high-level general assessments or narrowly focused, specific, detailed analyses, depending on the described scenario.

The goal of any presentation is to communicate a central message and achieve a specific objective within the given context. While particularly suited for presentations aimed at reporting or informing, the principles of the GPS model and the E-GOALS methodology for crafting presentations are equally effective for persuasive presentations. These frameworks provide students with a strategy to tailor the presentation's length and content to their audience's needs, ensuring an optimal balance of information and detail. They facilitate this by helping students outline the presentation's primary structure and topics. Specifically, the GPS model introduces a comprehensive set of criteria for evaluating presentations, encapsulated in the acronym E-GOALS, which stands for Overall Effectiveness, Graphics, Orals, Alignment, Lucidity, and Synthesis. These criteria guide the development of presentations that are not only coherent and aligned with their objectives but also engaging and clear to the audience, which starts with the most general sense of a presentation of any type and moves down through layers of connected descriptions to subsequent areas of interest related to understanding and unpacking the larger areas. E-GOALS used the GPS model to develop consistent language and hierarchies of language to structure the way criteria were described to make it more precise and coherent for students. When applied to oral presentations, these criteria allow the students to have a straightforward planning tool, performance structure, and assessment schema. At the highest level, the overall effect has three areas (content, delivery, and integration) that are rated. Many students consider these and often look for content coverage that reduces errors in delivery. By having students focus more on how content and delivery come together under integration, E-GOALS moves them toward how to effectively communicate a message to the target audience to attain a desired goal in the given scenario. This approach makes the resulting learning more

than just a summative performance towards a transferable skill to be developed and honed over time.

E-GOALS has consistent levels so that each general component has a set of particular elements that, in turn, have specific areas. The supporting materials utilize these same "terms and common structural elements" (Erlhoff & Marshall, 2008) to allow students to understand how this alignment of concepts matches the alignment of their content to be delivered and the necessary laments and aspects of effective presentation applied to their work. For example, the component of Orals can be broken down into three elements: Character, Diction, and Expression. Demonstrating competencies is simultaneously a form of intelligent behavior that showcases a diversity of tools created for use and a continuous life practice (Ribes & Varela, 1994). This is because the taught structure is transferred to the individual's beliefs, which are understood as life practices. Each of these, in turn, encompasses several specific areas to consider; for example, Diction is composed of Vocabulary, Word Choice, and Pronunciation. Each of these could be broken down further, but that would move the focus to very narrow issues tied to individual presenters and scenarios like an accent or use of jargon.

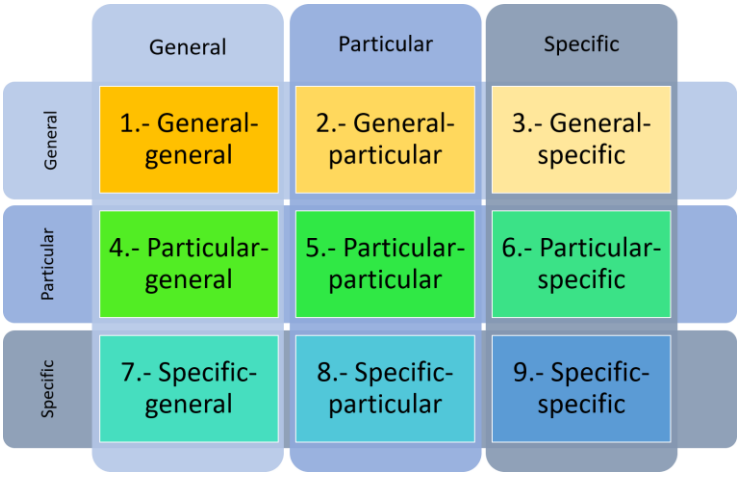
However, with the whole structure in mind, students can better understand where tier issues may lie and how very general or narrow feedback connects to the overall structure of the presentation. The three layers of the GPS model give a landscape of understanding rather than spotlights of issues or islands of criticism. Furthermore, the GPS model assists with the constructive alignment of the curriculum and instructional design by providing an order to the content replicated in the instructional materials and the Assessment via oral presentation, even going as far as labeling aspects of content with the GPS model terms. The content can be delivered more effectively as the student learns about what is needed and sees how to present it more effectively. The GPS model allows for a clear horizontal and vertical articulation of ideas that flow and identifies the breadth and depth of concepts as they are mapped out and explored. This scaffolding helps the students see how concepts fit together. At the same time, instructors have an easier time highlighting when students lack a complete understanding of content and are merely covering content from a source without fully comprehending how the concepts fit together or need to be explained to be understood. Based on previous research by the authors and their colleagues, the GPS model utilized here was piloted and tested, as discussed previously. The figures below show its application in the current scenario.

4 BRIEF DESCRIPTION OF THE GPS MODEL

The GPS model is structured under the "Competency-based student progress and assessment framework and the Information Age Paradigm of the Instructional Planning Design Theory" (Frey, 2018, p. 386); it focuses on the "Pedagogical Content Knowledge" (Frey, 2018, p. 983), (Ramírez-Montoya & García-Peñalvo, 2018). The GPS model consists of a 3x3 matrix (Illustration 1) created with the General, Particular, and Specific sections integrate the ideas of the logical models (Kellogg Foundation, 2004) with the "Mind maps" (Buzan, 2018; Buzan & Buzan, 1996), as well as "Concept maps" (Novak & Cañas, 2006; Novak & Gowin, 2004). The matrix generates nine sections, which are read logically from left to right and from top to bottom. In these nine sections (or boxes), the concepts will be placed from the most general to the most specific. The content structure will assist students in developing a clear storyline for their content as it aligns with storyboarding and narrative.

Figure 1

GPS Model matrix



Note. The intersections (e.g., General-general, Particular-specific) provide a detailed guide for presenters to structure their material effectively, ensuring alignment with audience understanding and content relevance

5 USING THE GPS MODEL TO DESIGN A PRESENTATION

The authors researched various aspects of effective oral presentations in STEM classrooms at multiple levels as part of Curriculum and Instructional Design projects and research articles (Bukiet & Lipuma, 2019). Part of this yielded the E-GOALS criteria (Lipuma & León, 2019), which were tested through a series of courses on oral presentation and then pilots in broader classes for Learning object design leadership and collaboration. Though the

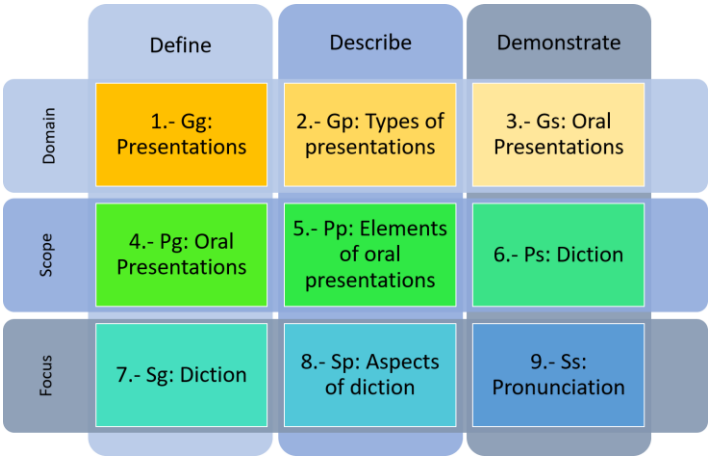
content was helpful to students and supported learning how to present effectively, students and faculty reported issues of student understanding. In assignments that demanded a deep analysis and comprehension of content to exhibit advanced cognitive skills, students in upper-division courses displayed significant improvement through applying the E-GOALS framework. However, students often expressed a need for additional guidance on how to organize content effectively and sought support in learning to use planning tools for creating impactful oral presentations. Responding to this feedback, the GPS model was integrated into the curriculum. When peer guidance is initiated from the outset as a conventional part of science education, it enables upper-level students, who are already more proficient in terms and concepts, to act as tutors and transitional models. This approach facilitates a reciprocal practice, feedback, and enhancement of communicative and instructional competencies in both synchronous and asynchronous modes, ensuring that students at all levels benefit from and contribute to the learning environment. This integration ensured coherence between the curriculum design, teaching methods, course materials, and formative and summative evaluation methods. Adopting the GPS model, the course was structured to enhance students' ability to organize their knowledge systematically and apply critical thinking skills more effectively in their presentations.

This was accomplished by organizing the work being delivered by the students into written and oral reports that contain descriptions at the General, Particular, and Specific levels. The materials to support these assignments were then provided, so the GPS model was introduced and explained in the concept of the E-GOALS criteria, as well as written reports and essays. Finally, the rubrics for judging work were tied back to the assignment descriptions to make the wording parallel. All of this was done to explore if this Model assisted students in understanding content, structuring oral presentations, delivering content effectively, providing feedback and criticism to others, and understanding instructor feedback to apply it to subsequent tasks.

Using the GPS model as a tool for designing oral presentations adds a new dimension to the Model by adding the concepts of Define, Describe, and Demonstrate on the X-axis and the concepts of Domain, Scope, and Focus on the Y-axis (Figure 2).

Figure 2

GPS Model example: From presentation to pronunciation



Note. This image portrays a three-tiered matrix that categorizes the development of oral presentation skills. The horizontal axis presents three stages of engagement—'Define,' 'Describe,' and 'Demonstrate'—while the vertical axis delineates the depth of focus, ranging from the broad 'Domain' of presentations to the specific 'Focus' on elements like Diction and pronunciation.

In the present example, the designer is designing an oral presentation about Presentations (1), which integrates the elements of oral presentations (5) and concludes with pronunciation (9).The GPS model is meticulously structured around nine foundational building blocks, each playing a pivotal role in shaping the framework for effective presentation design and delivery. At the outset, the "General-general" block focuses on defining the main domain, which in this context is presentations. This is followed by the "General-particular" block, which delves into the types of presentations and comprehensively describes each. The "General-specific" block then demonstrates these types through the lens of oral presentations, showcasing the main domain in action. Moving into a more focused realm, the "Particular-general" block defines the scope of oral presentations. In contrast, the "Particular-particular" block describes the elements that make up an oral presentation. The "Particular-specific" block narrows further to demonstrate Diction as a selected element of oral presentations. The progression continues with the "Specific-general" block, where the focus is refined to Diction, followed by the "Specific-particular" block that outlines the various aspects of Diction. Finally, the "Specific-specific" block provides a simplified example, focusing on pronunciation to demonstrate the application of the GPS model in honing a selected aspect of presentation skills. This structured

approach ensures a comprehensive understanding and application of presentation skills, from the general overview to the specific intricacies involved.

6 USING THE GPS MODEL IN CONSTRUCTIVE ALIGNMENT

The application of constructive alignment augments the application of effective instructional design to the aims of the curriculum. Several different design approaches can be utilized, but there is a need to align how students' progress and mastery of content are measured and assessed to align the instructional process. Major components should be presented with a common language and support one another through constructive alignment. Though different approaches may develop and implement the design differently, the result will produce a coherent collection of items tied to the descriptions of each task, delivery of lessons, and support with the methods of Assessment and feedback provided. Using the GPS model to overlay the five aspects of instructional design and match that to the GPS model for E-GOALS, the constructive alignment of the modular design of lessons and learning objects reinforces students' work. It enhances both their understanding and ease of access and learning.

For example, when assigning an oral presentation, the content to be delivered is mapped to a GPS model to allow students to have scaffolding that matches the lessons. In this way, they must define a domain, describe a set of categories/options, and finally demonstrate "*depth of knowledge*" or application of one of those described options that must tie back to the original domain. Similar hierarchies are brought out when teaching the content, and the model structure is highlighted in the requested presentation performance. These same terms are used when providing feedback on the presented content and the metrics used to rate and help improve the student's performance.

For the senior seminar course being examined, the presentation task content was designed with the use of the GPS model as a content mapping tool. Instruction was provided on the GPS model, supporting instructional materials were given online, and a small low-stakes presentation was assigned focused on the delivery of a simple GPS model matrix assessed with the E-GOALS criteria. By reviewing the criteria, an example of the GPS model to illustrate content mapping and layers of specificity was provided to students. The Assessment in the form of an oral presentation required the presentation of content in the GPS model matrix.

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assessed with the E-GOALS criteria. By reviewing the requirements, an example of the GPS model to illustrate content mapping and layers of specificity was provided to students. The Assessment in the form of an oral presentation required the presentation of content in the GPS model matrix. This allows the Assessment of the varying levels of content knowledge and effective presentation as the student defines the General (G) domain, describes in detail the Particular (P) categories identified, and then demonstrates the Specific (S) depth of knowledge within one of the categories. The student will then conclude the presentation by connecting the specific area to the general domain. Feedback provided on content was matched with delivery feedback in the same language of the levels of the GPS model using the terminology from E-GOALS. As students work to develop a compelling storyline and presentation content, they adopt the labels for the increasing degree of specificity to allow different domains to discuss content issues and organization in the shared space. Reading the GPS model with the series of vocabulary allows the translation of content into a more easily delivered and discussed standard set of boxes and leading statements. This aids students in communicating their ideas and helps assessments identify issues in the structure and organization of the content and possible issues in understanding relationships between and among content items and levels.

For example, by reading down the first column of the 9-box GPS model matrix, a student can easily describe the domain they are defining for their overall content, then move the particular scope of work for this topic and move to a specific area of interest for the current discussion. Though any terms may be applied as appropriate to the field, these simple scaffolds have been reported by students to provide students a means to express content more clearly as they prepare presentations. Similarly, the language prompts provided across any row assist students in organizing thoughts and have a means of adding signposts and structures to the oral presentation. If describing the scope of work, for example, they can begin by defining the particular project scope, move to the set of tasks to be accomplished, and then demonstrate their understanding of one of these at a time, teeing them back to the main topic of the scope of work or even to the larger domain. Another significant benefit is the ability to map sets of nested groupings or categories that may pose issues for students to communicate effectively. Though any concentric set of terms can be used, the E-GOALS and GPS model adopted the three layers of components, consisting of particular elements, each described by specific aspects. Those can be easily substituted when the subject matter dictates different names. In addition, if more layers are required, they can be added. For example, the E-GOALS components are part of the more extensive set of categories; those are areas of overall effectiveness. Similarly, the specific

pronunciation location may have several factors for the aspects comprising that Diction element.

The application of the GPS model not only aids students in conceptualizing their presentations but also in understanding the granularity of their content structuring. Initially, many students struggle with creating overly detailed outlines or making disproportionate leaps in their content progression, neglecting to consider the specific needs of their audience, time constraints, or other relevant situational factors. By the semester's end, students gain proficiency in crafting and delivering oral presentations that are well-organized and thoughtfully developed. This methodological approach, emphasizing structured content and terminology, facilitates peer sharing and critique, enabling students from diverse academic backgrounds to engage more effectively with each other's work. In the practice of science, conventionality dictates the framework of work. Wittgenstein (2009) suggested that there are language games that involve "playing" with conventionality in terms of precise language, technology suited to the demands of the activity, and the behavioral training of the practitioners for their proper introduction, training, and evaluation. It is through the design of the GPS model that all criteria for the precise teaching of the desired competencies are met. This integration acknowledges the importance of conventional frameworks within scientific practice, aligning the teaching of precise competencies with the nuanced demands of language, technology, and behavioral training inherent in scientific fields. This is particularly beneficial in collaborative settings, such as group projects or tasks that contribute to a cumulative final report or performance, where each presentation represents an iterative step toward a more significant, more comprehensive project outcome. To bridge the gap to the subsequent topic of facilitating effective feedback, it's crucial to recognize how the foundational skills developed through the GPS model and structured content presentation directly contribute to a more enriched feedback environment. Equipping students with a systematic approach to giving and receiving feedback significantly enhances their ability to engage constructively with comments from faculty and peers. This process is vital for refining their academic and professional skills. By moving away from vague or unhelpful feedback, such as generic praises or likes, towards a more structured and meaningful critique, students can engage more deeply in discussions and apply a discerning perspective to their work and that of their peers. The TRACES framework—encompassing Timeliness, Relevance, Actionability, Constructiveness, Empathy, and Specificity—offers a comprehensive strategy to support this shift toward more substantive feedback. This framework aligns with the principles outlined in "*Communication in the Real World: An Introduction to Communication Studies*" (Without attribution as requested by the work’s original creator or

licensee, 2016), serving as a guide to improve student reflection and critical thinking through feedback.

7 RATIONALE AND RESULTS

For educators interested in assigning oral presentations, combining the GPS model and E-GOALS will give students a structured approach to organizing content. By having a constructively aligned instructional design, students can plan the presentation more effectively and know the areas of knowledge that will be judged.

Each scenario presents its unique parameters, so drawing out the critical aspects at an appropriate level of focus is essential. A significant benefit of the GPS model is that it reduces the ad hoc nature of oral presentation assignment decryption while clarifying what is expected and how to measure it. In addition, within the course, students could quickly provide feedback (van Ginkel et al., 2017) by utilizing the E-GOALS criteria for discussing the aspects of the presentation and asking questions related to the levels of the GPS model to understand better and discuss the content. Moreover, as the class work was more challenging, student-to-student interactions adopted the terminology when talking about their work without specific direction from the instructor.

The application of the GPS model is limiting based on the scene in which the course is designed. Sometimes, the content being covered or the presentation style requires a different structure. However, for most general reporting intended to allow students to practice oral presentation, demonstrate content mastery, and elicit class discourse, the GPS model provides a strong scaffolding structure for constructing a constructively aligned instructional design. The existing materials for E-GOALS allow students to clearly describe complemented components, elements, and aspects of the effective practices that should be considered. Content and delivery are more easily integrated when paired with the GPS model.

One drawback of the GPS model is that it limits student understanding and willingness to move away from content coverage. Until it is widely adopted, the steps of a three-box GPS model matrix led to the undemanding of the interim content descriptions are necessary. Novice presenters had difficulty grasping the sophisticated application of the fully articulated Model. Students who were less confident in both content and delivery defaulted back to reading source materials or duplicating the way information was presented.

GPS model-style presentations are best suited for reporting or explaining topics. Arguments that naturally fall into a "set of claims" (Peregoy, 2017) with arguments and evidence

along a line of thought also work well. When applied to open sales or pitches, the GPS model is applicable, but students with less proficiency show more difficulty in using it to structure content and enhance effective delivery. Much of this appears to be related to the student's level of knowledge and experience and the length and depth required by the presentation scenarios each presenter finds him or herself within.

8 CONCLUSION

In conclusion, the authors believe communication is essential in all career paths. Education must improve the tools required for this transferable essential skill to achieve a better outcome. In collaborating with a transdisciplinary approach, the authors included employers, educators, students, and multiple organizations in the STEM ecosystem that require effective oral communicators. Future research is needed to identify critical factors necessary to facilitate the integration of the GPS model with the syllabi of engineer STEM classes, as well as the impact and implications of aligning this tool and integrating it into the instructional design in Face-to-face and online courses.

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