Journal of Systemics, Cybernetics and Informatics (2025) 23(6), 68-72
https://doi.org/10.54808/JSCI.23.06.68

Using Workbook Templates to Improve Teaching

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ABSTRACT

The paper advocates the use of templates to significantly improve pedagogy. By templates, also sometimes referred to as a workbook approach, the intent is on providing model solutions with key words or phrases omitted; the student, after training in the use of the template, fills in these omitted phrases or words when attacking a new problem. However, to accomplish pedagogic improvement, templates must be accompanied by higher-order instructional strategies including contrasts, decisions, evaluations, and componential analysis. The theory presented is fully consistent with a variety of educational hierarchies such as those of Bloom, Anderson, Van Hiele, and Marzano. The theory is also consistent with the four educational pillars of Hendel. The theory is supported by literature; illustrations are provided from statistics and literary analysis.

Keywords: hierarchies, scaffolding, templates, workbook, Bloom, Anderson, Marzano, Van Hiele, goal-setting, executive function, statistics, logic, literary analysis

1. THE PROBLEM

1.1 Paper Goal. This paper advocates using templates or a workbook approach as a means to improving pedagogy. In this article, the terms *templates, workbook approach,* or *workbook* refer to (collections of) worked out solutions to particular problems with certain words and phrases left deliberately blank; the template or workbook approach instructs students to use the template by filling in these blanks. The template or workbook can, or should be, accompanied by model problems, explanations, and even thought-provoking questions. A typical example, used in an introductory statistics course, is presented in Figure 1. Although *workbooks* may include more than templates, for purposes of this article, the terms *template, workbook,* and *workbook approach* will be used interchangeably.

1.2 The Problem. Before proceeding, there is an immediate problem with using templates as defined and presented in Figure 1. The template basically uses memorization and is consequently a low-level pedagogic activity. In fact, one study [18] found that teachers who use workbooks for instruction in their classes experienced lower performance when they were compared with instructors who used any one, or combinations, of several other instructional methods such as laboratory demonstrations, field trips, class projects, direct teaching (lecture and discussion with the entire class), or small student-led groups.

1.3 Pedagogy Theory. This critique can be significantly strengthened by using concepts found in the pedagogic literature.

MODEL PROBLEM: COMPUTING VARIANCE

A student's grades are 90,60,100,70. Compute the variance of the grades.

MODEL SOLUTION: COMPUTING VARIANCE

First, one computes the mean grade: 1/4(90+60+100+70)=80. Next, one computes the absolute distance from each grade to the mean: 10=90-80, 20=80-60, 20=100-80, 10=80-70. Finally, one takes the mean of the squares of these distances: 1/4 (10^2+20^2+20^2+10^2) = ¼ (100+400+400+100)= ¼ (1000)=250.

RELATED COMPUTATIONS

If one takes the square root of the variance one obtains the *standard deviation*: 15.81 = Sqrt(250).

250 and 15.81 are called the population variance and standard deviation. If one multiplies the variance by ¾ one obtains the *sample variance*: 187.5 = 3/4 *250. If one then takes the square root of the sample variance, one obtains the *sample standard deviation*: 13.69 = SquareRoot(187.5)

THOUGHT QUESTIONS:What are these measures good for?

The mean measures the *typical* value. This student is doing about 80ish work. The mean is also said to measure the *tendency* or the *central tendency* of the data.

Contrastively, any of the four measures – *variance population, variance sample, standard deviation population, standard deviation sample* – measures the *variation,* or the *scattering* of the data.

CONTRASTIVE EXAMPLE ON USE OF MEASURES

Student A has grades of 80,80,80,80; Student B has grades of 90, 60, 100, 70. Both students have a mean of 80. That is, both students have a *tendency* toward 80. But student B has a wider variation or scattering of grades while student A is more consistent in their grades.

TEMPLATE INSTRUCTIONS (How to use the template)

In any problem you should:
* Copy words that are not underlined
* Substitute new words or numbers for those underlined
* Omit non-underlined words having nothing to do with the particular problem asked.

Figure 1: Model Template for Variance (Statistics course)

The Bloom and Anderson pedagogic hierarches [3,4] each posit 6 levels of pedagogy: *Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation*, for the Bloom hierarchy, and *remembering, understanding, applying, analyzing, evaluating, and creating*, for the Anderson hierarchy. Both hierarchies agree that memorizing, *remembering* and *knowing,* are the lowest levels of pedagogy. How then can this paper advocate the use of templates? Why study the technique altogether?

1.4 The Theory Responds. But the theory actually responds well to this critique by pointing out a subtlety in the hierarchies. Bloom-Anderson does not advocate:

- Exclusive use of the higher pedagogic techniques in the hierarchy such as *analysis, evaluation, synthesis, and creativity,* but rather
- The combined use of all stages of the hierarchies, the point being that although learning must take place on a foundation of knowledge and remembering, it does not end there, but, rather, must culminate in *analysis, evaluation, synthesis,* and *creativity.*

Marzano [16] who also introduced a hierarchy, explicitly fought against a tendency to exclusively emphasize the higher stages of a hierarchy; he instead advocated a combined approach.

1.5 Figure 1 Revisited. This response is already incorporated in Figure 1. For Figure 1 does not exclusively consist of the *formula* for the variance. Rather, it consists of this formula in the *context* of contrasts and applications.

- There are two variances (population and sample); each variance is accompanied by a sister metric, the standard deviation. This utilizes the *analysis* stage in the Marzano hierarchy which includes *matching, classifying, and generalization* [14,15].
- Similarly, the contrastive example with students A and B also illustrates the Marzano *analysis* stage.
- The formulas are accompanied by their functional purposes; means are *good for* describing tendencies while standard deviations or variances are *good for* describing scatter. This corresponds to the highest level in the Marzano hierarchy, *knowledge utilization,* which includes *decision making,* studying how metrics can be used.
- Even the use of the template requires critical thinking to identify what is the same (copied), what is replaced, and what is omitted. This corresponds to the *analysis* stage in the Marzano hierarchy which includes *error detection*. (As a simple example, a solution responding to a new question requiring computation of the sample standard deviation, must keep the calculation of the population variance and sample variance but must omit calculation of the population standard deviation which is not needed for calculating the sample standard deviation.)

1.6 The Paper's Goals Revisited. The above considerations allow a more accurate description of the paper's goals. The paper advocates the use of templates to significantly improve pedagogy. Towards this end, templates must be accompanied by higher-order instructional strategies including contrast, decision, evaluation, and componential analysis. The theory is fully consistent with a variety of educational hierarchies such as those of Bloom, Anderson, Van Hiele,` and Marzano. The theory is also consistent with the four educational pillars of Hendel [11]. The theory is supported by literature; illustrative examples are provided below from both statistics and literary analysis.

2. THE LITERATURE

2.1 Basic 2-Treatment Studies. There is a rich and varied literature on templates addressing multiple aspects of the approach. Some papers simply and straightforwardly study two treatments of a teaching situation, one with workbooks and one without. By performing statistical tests one can show that the template approach yields superior performance. Besides studying improved performance these papers also study improvements in student attitudes, interests, and confidence. These papers cover a wide range of subjects and settings [1, 4, 7, 19].

Other papers simply provide detailed course-focused templates and workbooks for a variety of settings [9, 17]. Still other papers point out that workbooks, besides their primary value as a source of practice exercises, also serve a secondary purpose to assist in defining the extent of a curriculum. For example, one paper advocates using workbooks to implement the Common Core State Standards [5,12].

2.2 Stifling or Encouraging Creativity. Other papers discuss the pros and cons of templates similar to the discussion in the introductory section of this paper with an emphasis on how templates should be used to achieve success. A good example of this type of analysis is found in Fuller and Pence, [8], which is now reviewed in more detail.

Fuller and Pence summarize and respond to the controversy of using a template approach to teaching academic writing in the context of literary analysis, an approach found in a beautiful but controversial book by Graff and Birkenstein devoted to such an approach [10]. In the opening paragraph of their article, Fuller and Pence succinctly summarize the situation.

> In an effort to revitalize the effectiveness of first-year writing courses and unveil the complexities of academic language for students, Gerald Graff and Cathy Birkenstein created their famous guidebook to academic writing, *They Say/I Say* [10]. Their primary method for "demystifying academic writing" was to isolate the "moves" of academic writing and present them as fill-in-the-blank templates into which students can insert their own content. These templates, according to Graff and Birkenstein, grant students access to the language needed to engage in academic conversations and thereby facilitate students' ability to think critically. Although Graff and Birkenstein's approach continues to receive glowing praise and is used at more than 1,500 higher education institutions, critics of the formulaic and potentially debilitating effects of using templates assert their voices against the template tidal wave. We seek both to temper the enthusiastic blanket approach to implementing templates and to resolve the concerns of skeptics who ignore the potential benefits templates provide to student writing.

The next paragraph echoes the requirements for successful use of templates presented in Section 1 above.

> *They Say/I Say* is appealing for its simplicity and its sentence-specific templates, which assist students in expressing their own ideas in response to the voices of

> others. But our concern for student learning leaves us wary of such a formulaic method for teaching because students need not only the skills that the template can provide, but also instruction within the context and practice of such skills. Though templates can serve as useful tools for students, templates without the context provided by models and experience gained through practice can limit critical thinking, stifle learning, and mislead students' ideas of proper engagement with other texts in their own writing. If used incorrectly, templates will work against their intended purpose. However, when coupled with models and application exercises, the templates of *They Say/I Say* can be useful tools to guide learning. So, while we first want to explain the widespread popularity and magnificent potential of *They Say/I Say* and its recommended templates, we will also discuss some critiques of templates and Graff and Birkenstein's text specifically. Finally, we will propose how the templates of *They Say/I Say* can and should be used—asserting that for them to be effective for student learning, they must be preceded by models and followed by practice and application

To support this, they in fact cite *They Say / I Say* which echoes similar sentiments. Here is their summary of what *They Say / I Say* says about the pros and cons of templates.

> Acknowledging some teachers' reluctance to brainwash their students with templates, Graff and Birkenstein assure that templates, rather than supplanting students' voices, enable students to "generate what they want to say" by supplying the tools needed to express themselves—much like creating words when given flashcards of the alphabet. Graff and Birkenstein point out that templates "focus writers' attention not just on what is being said, but on the *forms* that structure what is being said," that they allow students to be "conscious of the rhetorical patterns" used in writing. Although they recognize the counterargument that using templates suggests "a return to prescriptive forms of instruction that encourage passive learning," their intent is not to provide a cut-and-paste word-box for students; they instead hope to show students the calculated moves "seasoned writers pick up . . . unconsciously through their readings. . . . The aim of templates, then, is not to stifle creative thinking but to . . . [show] the key rhetorical moves that it comprises." Graff and Birkenstein approve of students "modify[ing] and adapt[ing]" the templates to fit the "particularities of the arguments" in students' work, hoping that templates will be used as a "learning tool" and not a "formulaic" writing process.

Thus, the problem with templates is that "without teaching context, students will know that they need to fill in the blanks but will not know what to fill in the blanks with, having effectively memorized a reference or set of words but failing to master the skill. For long-term learning to occur, teaching writing skills needs to take students to a level of mastery where they can apply the skill without needing to reference a template." Fuller and Pence cite other authors who are also concerned that *They Say / I Say* is a throwback to formalism, to the idea that teaching consists exclusively of standard forms.

Fuller and Pence cite several authors and conclude that templates such as those in *They Say / I Say* can be valuable if

- *Preceded* by models explaining *why* the templates advocate what they do and the context in which each template should be used, and
- *Followed by* sufficient practice exercises to given students mastery.
- Additionally, Fuller and Pence are quick to point out that the models by themselves, without the templates, are not sufficient for pedagogic success, the reason being that "they throw too much at students." The beauty and simplicity of templates is that they enable students to digest a complex process with a series of short bites each focused on a component skill. Thus, the templates become a necessary first step, an introduction, to the rich variety of additional pedagogic techniques by which writing is taught.

2.3 The Underlying Pedagogic Theory. This last bullet, emphasizing that templates break a complex process such as literary analysis or academic writing into bite-size digestible chunks, is an excellent segway to other papers that discuss the theory behind template success. They explain that the success of templates arises from the pedagogic technique of scaffolding [6]. Scaffolding is a complicated technique, but it first focuses on breaking up a complex task into a series of component tasks; additionally, as learning progresses the instructor changes roles from a director of tasks, to a coach of tasks, until receding into the background and the student achieves mastery. Hendel [11] has explained that the fundamental pedagogic process involved is that of goal-setting, a widely used technique, especially in the business world. Goal-setting theory teaches that for maximal performance a complex process should be broken up into component processes each of which has specific characteristics such as being clear and unambiguous, being achievable in a reasonable amount of time, and having clearly defined goals which can be recognized when achieved.

The use of goal setting greatly facilitates understanding the controversy around *They Say / I Say.* In fact, the use of goal-setting helps understand why this example occurs in the literary versus the mathematical space. Mathematics courses, especially lower-level undergraduate courses, tend to focus on problems with well defined solutions. True, one could teach, for example, statistics by requesting students on examinations to do an entire analysis of an experiment with a well defined null and alternative hypothesis, or, to use another example, one could teach calculus graphing by simply asking on examinations that students graph a 4-th degree polynomial. In practice, however, this is not done. For one thing, there is no standard way of allocating partial credit to answers that are not fully correct. Instead, mathematics courses focus on components of long processes. A student might be asked to graph the region of a graph that is increasing and concave downward. Similarly, a student might be asked to compute the statistic in a hypothesis test and ascertain if it lies in the critical region. Contrastively, literary analysis by its very nature is complex. And precisely because it is complex, standard dilemmas arise: If the instructor encourages thinking holistically about the problem then too much is thrown at the student who can't learn; but if the instructor breaks up the problem into component parts then the instruction has leaned towards formalism and stifled creative thinking. It is precisely in such a situation that techniques like scaffolding building on goal-setting theory and illustrated by templates can be useful *provided* the templates are properly used. There however is no reason why these techniques cannot be extended and applied to the mathematical space.

3. EXAMPLES

This paper has laid the basic ideas of good template use in Section 1 and has further reviewed the literature in Section 2. This section reviews examples of templates. Here, there is an obvious problem: templates, as discussed in Section 2.2, are best when the underlying topic is complex; but a complex topic requires a lengthy template that provides context, a model problem, the template, and model solutions. The paper deals with this problem by providing snapshots and key ideas accompanied by references giving complete detail.

3.1 The Central Limit Theorem. Perhaps the hardest topic in a statistics course is the central limit theorem. The student who has struggled with understanding a single distribution is now overwhelmed with four distributions: The population distribution, the distribution of any particular sample, the distribution of sample averages, and the approximating distribution to the sample-average distribution. The resulting confusion from simultaneously dealing with four distributions is the key driver of the difficulty of this part of the course.

Carlson and Winquist [4] provide a 7-page template to this difficult subject. A brief outline is provided below building on the requirements of template components to address a model problem, a template, practice exercises, contrasts, uses in decision making, which have been previously discussed.

The template starts with a list of objectives presented in Figure 2.

o Explain what a distribution of sample means is.
o Explain how a distribution of raw scores is different from a distribution of sample means that is created from those raw scores.
o Find the mean and the standard deviation of a distribution of sample means.
o Explain what the standard error of the mean measures.
o Compute sampling error.
o Describe how the standard error of the mean can be decreased.
o Explain why you would want the standard error of the mean to be minimized.

Figure 2. List of learning objectives for the template.

The template then presents some thought-provoking questions: *Why are researchers frequently forced to work with samples when they are really interested in populations? When researchers work with samples, there is always the risk of large amounts of sampling error (i.e., getting a sample the does not represent the population accurately). Why is sampling error a problem for researchers? Given this problem are their ways to minimize the sampling error?*

The main step, built on an idea from another text, uses a population of four items to create, using a table template which students must fill in, the list of 16 samples of size 2 from this population; students must also calculate the mean of each sample. Then, by creating a histogram of the means the students are able to answer such questions as *Are all samples representative of the population? Is there a central tendency of the sample means? How does the average sample mean relate to the population mean? How does the standard deviation of the sample means relate to the standard deviation of the population? Does the histogram of the sample means look like a previously discussed distribution in this course?*

In this way, the students are led through a sequence of steps exposing them to the Central Limit Theory and more importantly enabling them to understand why such a theorem is important and needed. The template, of course, goes through all required computations needed for the central limit theory, but importantly, the template accompanies these computations with needed context and explanations.

3.2 *They Say / I Say*. Section 2.2 has discussed both the pros and cons of the approach of this book. This section provides an outline to the introductory chapter.

The book starts out by pointing out that academic writing is very complex with many possible ways of presentation possible. The book's basic premise is that the variety of presentations have a collection of forms and templates that underly them. By learning and using these templates, students can begin writing effectively immediately.

The book then introduces the first of its templates the *They say / I say* template. It does this using Martin Luther King's famous 1963 letter from a Birmingham jail. Recall, that 8 clergymen objected to King's civil rights protest. The first few sentences of his letter are presented in Figure 3.

You deplore the demonstrations taking place in Birmingham. But, your statement, I am sorry to say, fails to express a similar concern for the conditions that brought about the demonstrations. *It is unfortunate that demonstrations are taking place in Birmingham*. It is even more unfortunate that the city's white power structure left the Negro community with no alternative.

Figure 3. Excerpts from King's letter of 1963.

In Figure 3, the italicized statements represent what King's opponents had been saying, the *They Say,* while the underlined passages represent King's response, the *I Say.* This illustrative example neatly presents the *They Say / I Say* template of writing. The book brings several other examples. Moreover, the book presents the following variations on the *They Say / I Say* template showing how to incorporate agreement and citations into one's writing.

- She argues _____ and I agree because _____
- Her argument that ____ is supported by new research showing that _____
- In recent discussions of ___, a controversial issue has been whether ___ . On the one hand, some argue that ___. From this perspective,____ . On the other hand, however, others argue that ____. In the words of ____, one of this view's main proponents, "____" According to this view,____ . In sum, then, the issue is whether ___ or ____. My own view is that _____ Though I concede that_____, I still maintain that____ . For example, _____. Although some might object to that _____, I would reply that ____. The issue is important because _____.

The book then explains what the templates accomplish. *First the template helps identify the underlying issue; then it assists with identifying areas of agreement and disagreement; it also assists in identifying sources and support for arguments.*

Finally, and as discussed above in Section 2, the book addresses whether the templates encourage or stifle creativity. The book's bottom line response is:

> *Even the most avant-garde, cutting-edge artists (like improvisational jazz musicians) need to master the basic forms that their work improvises on, departs from, and goes beyond, or else their work will come across as uneducated child's play. Ultimately, then, creativity and originality lie not in the avoidance of established forms but in the imaginative use of them. Furthermore, these templates do not dictate the content of what you say, which can be as original as you desire, but only suggest a way of formatting how you say it.*

4. CONCLUSION

This paper has reviewed and advocated the use of templates and workbooks as a means of achieving pedagogic excellence. Templates are particularly useful for complex problems. Their strength lies in their simplicity; a student need only copy language, omit irrelevant passages, and fill in appropriate places. To be effective, templates must be accompanied by context, model solutions, practice exercises, and higher order pedagogy including contrasts, causes, goals, and purposes. Readers are encouraged to create templates for their particular situations and apply them for pedagogic success.

A particularly rich possible outgrowth of this paper, not explored inside it, is the application of templates to different educational settings such as K-12, college, and the University setting. The principles of proper goal-setting do require templates in each of these settings but most likely the template form will be different.

5. REFERENCES

[1] Ahmet Selçuk Akdemir and Aysel Eyerci, "Using Writing Templates as Materials to Improve Writing Skills in EFL Classes: An Experimental Study**," Mersin University Journal of the Faculty of Education,** 12(2), 2016. 747-756.

[2] L. W. Anderson, D. R. Krathwohl and B. S. Bloom, **A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives**: Complete Edition, NY: Longman, 2001.

[3] B. Bloom, Taxonomy of Educational Objectives: **The Classification of Educational Goals**, NY: Longman,1956.

[4] Kieth A. Carlson and Jennifer R. Winquist, "Evaluating an active learning approach to teaching introductory statistics: A classroom workbook approach," **Journal of Statistics Education,** 19(1), 2011.

[5] Jaehwa Choi, Miseon Kang, Najung Kim, William Dardick. and Xinxin Zhang, "A Smart Way of Coping with Common Core Challenges − Introduction to CAFA SmartWorkbook," **Journal of Educational Issues,** 1(2), 2015, **http://dx.doi.org/10.5296/jei.v1i2.8381**

[6] Paul T. Corrigan, "Scaffolding Critical Reading." **Teaching and Learning Inquiry,** 11, 2023, https://doi.org/10.20343/teachlearninqu.11.23

[7] Love Effiong Ebuk and Oladele O. Bamijoko, "The effective management of mathematics workbook: Sure remedy to students' performance in mathematics," **International Journal of Advanced Multidisciplinary Research,** 3(4), 2016, 46--53.

[8] Lauren Fuller and Jared Pence, "Contemplating Templates: Teaching for Mastery with Graff and Birkenstein's *They Say / I Say,"* **Locutorium,** 8(2), 2013.

[9] Steven M. Gerson and Sharon J. Gerson, "Using Templates to Teach Technical Correspondence," **Technical Communication**, 38(4), 1991, 570—572.

[10] Gerald Graff and Cathy Birkenstein, **They Say / I Say, The Moves that Matter in Academic Writing,** NY, NY: Norton, 2010.

[11] R. J. Hendel, "Leadership for Improving Student Success through Higher Cognitive Instruction", in Ronald Styron and Jennifer Styron, Editors, **Comprehensive Problem-Solving and Skill Development for Next-Generation Leaders**, Hershey, PA: IGI Publishing, 2017.

[12] Ursula Hoadley and Jaamia Galant, "An analysis of the Grade 3 Department of Basic Education workbooks as curriculum tools," **South African Journal of Childhood Education**, 6(1), 2016, a400, https://doi.org/10.4102/sajce.v6i1.400

[13] Robert Johnson, "Writing from Templates: Shaping the Formal Essay," **Journal of Developmental & Remedial Education** , 7(1), 1983, pp. 22-23.

[14] R. Marzano, **Designing a New Taxonomy of Educational Objectives**, Thousand Oaks, CA: Corwin Press, 2001.

[15] Robert J Marzano, **Classroom management that works: facilitator's guide**, Alexandria, Va.: Association for Supervision and Curriculum Development, 2004.

[16] Robert Marzano, "Setting the Record Straight on high-yield strategies," **Phi Delta Kappan**, 91(01), 2009, pp. 30-37.

[17] Alejandro Quintela-del-Río and Mario Francisco-Fernández, " Excel Templates: A Helpful Tool for Teaching Statistics," **The American Statistician**, 71(4), 2017, pp. 317--325.

[18] Mary H. Shann (Boston University, Massachusetts School of Education), **Making Schools More Effective: Indicators for Improvement.** 1990, ED 327559.

[19] Muhammad Syazali*, Muhammad Erfan, Baiq Niswatul Khair, Aisa Nikma Rahmatih, and Hasnawati, "The Effectiveness of Template and Example Paper Implementation in Developing Student Writing Skills in Science Courses," **J. Pijar MIPA**, 18(3), 2023, 336—342.

[20] P. M. Van Hiele. **Structure and insight: A theory of mathematics education**. Orlando, FL: Academic Press, 1986.