Preliminary Results of Using the "Take-Away" Technique on Students' Achievements and Attitudes in a Graduate-Level Online Course in Learning Theories

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Abstract

This study required graduate students to write short weekly summaries of the key concepts, ideas, theories and events that occurred in all activities and readings for the week in an online course in theories of learning. The course was conducted twice with two different groups of graduate students two semesters apart. Little to no feedback was given to these graduate students on the TA's they wrote on purpose. Three essay exams were given to these students on course content 5 weeks apart and one essay question on the last exam asked these students to identify and rank order three positive benefits they found in doing the TA's (and explain why) and three negative aspects they found in doing TA's and how these negatives could be eliminated in their opinion. The quality of student Takeaways online, using a simple four level scoring rubric, predicted essay exam achievement (letter grade) at r= +.62 across the 3 exams with students being positive about the technique by the first exam. The quality of online student responses to essay exam questions improved remarkably over the semester in a non-linear fashion with the "take-off" occurring again on the second essay examination. Online graduate students cited 86% of the possible benefits they could maximally state for the technique with 84% of the benefits cited falling in the comprehension and retention enhancement categories predicted by Takeaway theory as the primary benefits the technique should achieve. This result suggests that the Takeaway Technique may be particularly effective in increasing higher order achievement learning in online courses as opposed to other types of instruction, but further research is needed on this point.

Keywords: online learning, higher order learning, achievement enhancement, anxiety optimization, meta-cognition, self-regulated learning, learning by writing content, the takeaway technique

1.0 Theoretical Framework

According to contemporary cognitive learning theory (e.g., Bruning et al, 2012; Ashcraft, 2001; Carifio, 2005; and Schunk, 2011), the back-end of the learning process would be processes, activities and assignments that organize, elaborate, consolidate, connect, and incorporate what the student should be taking away from an (instructional) exchange or event into the student's long term memory. However, cognitive theory also contends that all of these back-end learning processes should not be prescriptive (namely, done by the instructor or the instructional agent), but rather that they should be actively done by the student and should be a well-established meta-cognitive student habit; namely, a continuously cognitively active and self-regulated learner (see Green & Azvendo, 2007; and Dinsmore et al., 2008 for details). This view of learning and instruction has been characterized as learning asa do-it-your-self project (with occasional guidance and high quality feedback) and learningin spite of things, difficulties, obstacles and the environment, or more succinctly, learning character (see Eagle, 1997; Reivich & Shatte 2002; and Carifio, 2005 for details). Various aspects, components, and dimensions of this theoretical view, moreover, are present in the works of Spielberger (1972), Ausubel (1976), Maier & Seligman (1976), Mandler, (1989), Erikson (1993), Dagostino & Carifio (1994), Kintch (1998), Meeter & Murre, (2004), van Dijk (2006), Pinker (2009), and others, and each will be commented on in more detail below where necessary. The Take-Away Technique is one (highly versatile) way of operationalizing the above view and theory as part of any formal or informal learning event or informational exchange.

A strong focus on backend learning activities being actively done by students rather than other instructional agents, under conditions of optimum stress, is what creates and consolidates long term memories, as well as creates schemas and their elaborations and accommodations (see Meeter, M. and Murre, J.,2004 for details). Active, demanding, and focused performances by the students under conditions of optimal stress, therefore, are key, and particularly the optimal stress component of the Take-Away technique, which is necessary for obtaining these post learning effects, which are affective as well as cognitive, and meta-cognitive as well.

2.0 The Take-Away Technique

The Takeaway technique is the operational component of an instructional system that develops a student's Take-Away skills and habits. The cognitive learning theory view of the "take-way" technique, therefore, focuses on *the student* actively extracting and creating the meanings and messages of the exchange rather than "zoning out" and passively waiting to be told what the meaning and messages of the presentation or exchange were or are. The *student* must figure out and create the "gist" of the meanings and messages in the exchange and then must formulate them into a form that can be communicated to others, both inhibiting and facilitating a transition from inner private egocentric speech, which is characteristic of lower developmental levels and informal, abbreviated, shallow and truncated information processing. It is the *student*, therefore, who must actively organize and sort out the meanings and the messages and elaborate them and organize them into wholes and schemas that may be expressed to others and are in a form that is more amenable to being incorporated into long term memory. The cognitive learning theory form of the take-way, then, *intentionally* acts to inhibit student passivity and learned helplessness, as it *transfer the responsibility* and task of extracting and organizing the meanings and messages of a presentation or exchange to the student and makes the student actively do these key cognitive tasks and processes, and actively practice them with each exchange. The Take-Away technique, therefore, focuses on building learning character and responsibility over time, which is not the prevailing paradigm in American education and schools today, and cognitive learning theory predicts that student learning and particularly higher order learning should increase over time through being actively responsible for and engaging in these key *back-end* processes.

If the Takeaway technique resembles any existing form of "writing," it would be old fashioned expository, scholarly or didactic writing (see Kanallis, Carifio and Dagostino, 1998 for details) or the new type of "analytical writing" recently called for by the new president of ETS David Coleman (see Strauss, 2013) and implicitly in the new common core standards. One might also see the Take-Away as "Writing to learn *content*" or opposed to "Writing to learn [*writing*]." However, one does not actually have to *physically* "write" a Takeaway for the technique to produce its many effects, as once one is skilled in the technique one can create *virtual* Takeaways after learning exchanges, as well as different points along the way, that will have many of the effects of physically written Takeaways in a more abbreviated or diluted form. The Takeaway technique (and the actual Takeaway itself as well), then, is a meta-cognitive self-management device, component, and strategy that one acquires and makes part of one's meta-cognitive system developmentally over time, if the learning environment in the broadest sense of the terms encourages and facilitates this development, but particularly so if the learning environment requires one to develop some if not all of the abilities, skills, attitudes and habits needed to be successful (and intrinsically rewarded in particular) in the contexts in which the learning is occurring in terms of *higher order learning and understandings* (i.e., both the relative cognitive load and demand of the environment is high and not low), as well as beyond these contexts in the work being done and the work of one's life to come. The Takeaway technique, then, may be clearly and easily related to the development of the "executive" component of the student's information processing system and capabilities (see Carifio, 2005 for details) as well as to the meta-cognitive, knowledge, long term memory and performance components of the student's information processing system and the various changes that occur to these components and the state of the student's knowledge, beliefs, attitudes, understandings, thinking and problem solving capabilities (see Perla and Carifio, 2005 for details). The Takeaway technique may also be related to a wide variety of current and past literature in the cognitive, social learning and developmental paradigms, but doing that is for another time and another place.

3.0 Initial Results

Iinitially tested the "take-away" technique in an undergraduate cognitive psychology class with 33 students, which was conducted at a public university in the Northeast (see Carifio et al., 2013 for details). Most students in the class were juniors or seniors.

The class had roughly the same number of males and females and roughly half were psychology majors and half were not. The students were given the assignment of producing a one-page written *summary* (the minimum) of what they considered to be the key points, exchanges, and messages of the 90 minute class that occurred twice a week w*ithin* 24 *hours of the class* and to submit their "take-away" for the class to the instructor's teaching assistant. The Take-ways for the classes counted for 20% of their grade. There were 30 classes in the course and the instructor sometimes lectured and sometimes engaged the students with Socratic questioning and various class activities directed at illustrating the tenants of cognitive psychology and cognitive learning theory. The course had*3*written *in-class essay* exams on the readings assigned both before and after class and the essay exams were spaced 5 weeks apart. The questions on the exams were questions that required the students to explain and elaborate course content, concepts, principles and theories and to relate aspects of course content together in their written responses (i.e., the environmental demand component and condition). The exams also had one question that was an applications question that required higher order critical thinking. Several other factors were also built into this study and data were obtained on these students which consisted of GPA (M=3.09, SD=0.52), Verbal SAT (M=519, SD=98), Math SAT (M=517, SD=92), and SAT (M=516, SD=85) writing sample scores.

A question on the final exam asked students to cite and rank order what they found positive about the Takeaways they had to write during the course (and why) and what they found to be the negatives of writing Takeaways (and why) and what they would do to correct the negatives. This question's *chief purpose* was to assess if the students' perceptions and assessments of the Takeaway technique were congruent with the technique's theory and predicted benefits (and predicted negatives or drawbacks as well), but the question also assessed the student's higher order understandings of the course content (it *was* a course in cognitive psychology), and the students ability to think using this content and apply it to the analysis and evaluation of an actual learning experience they had. *No to minimal feedback* was given to students on their Takeaways and no model answers were given out, nor were students asked to share their Takeaways with other students or get feedback from other students on their Takeaways **on purpose** in order to estimate what effects would be obtain if the professor or teacher *did nothing or very little* relative to the Takeaways after initial explanations and guidance as to whether or not the first two TA's written by the student were in the acceptable zone or not. Establishing this baseline was important for several reasons, but particularly relative to the issue that using the Takeaway technique would be *burdensome to instructors* because of the increased workload of 'scoring" them. I read and monitored all TA's each week to make sure that each student was writing an "original TA" more or less that met the basic criteria for an acceptable TA and to ensure that no student was founding badly relative to learning the content for the week and about to go "code blue" in the course.

The quality of student Takeaways, using a simple scoring rubric, predicted essay exam achievement at r= +.45 across the *3*exams with students being positive about the technique *by the end of the course*. Students' Math, Verbal, and Writing SAT scores **did not predict** the quality of the Takeaways they wrote (as predicted), or their scores (grades) on the 3essay examinations in the course. These *failures to predict finding*s are critically important for a number of reasons, but they fairly strongly rule out several major rival hypotheses to Takeaway theory and the sources and cause of effects in this study, and they are strong confirmatory evidence for TA theory, given that confirmatory evidence alone is not proof of cause or theory, but only significantly increases the probability that the theory and the attribution of cause are correct. However, one must be somewhat cautious about these results as the sample size was only 30, even if it was a fairly diversified and representative sample. Student evaluations of the Takeaway technique were congruent with both the model and theory of Take-A ways developed as determined by the coding of the positive and negative reasons by two independent raters using an outcomes-based scoring topology based on the theory (see Carifio et al., 2013 for details). Students reported that the TA's improved their studying, comprehension and writing skills as well as their understanding and retention of the course content and their ability to successfully answer the higher order essay questions on the three exams given. They also reported that the TA's required them to prepare for class, attend class, and pay attention in class and be cognitively active after class or the TA's where extremely difficult to do, *which is exactly what the TA were designed to do as they are an unobtrusive behavioral control and activating device*. These students were also fairly insightful about the negative aspects and downsides of the version of the TA technique they experienced, even though some of the negative aspects mentioned were done on purpose. The quality of student responses to in-class essay exam questions *improved remarkably* over the semester in a non-linear fashion with the "take-off" occurring on the second in-class examination.

The repeated measure ANOVA with trend, $F(2, 28) = 9.2$, accounted for 24% of the variance, which is a large effect given that most instructional factors tend to account for 3 % to 10% of the variance on the average. As predicted, the cognitive Takeaway was particularly successful with and helpful to students who were novices in the subject-matter to be learned. Further, students reported that their stress levels associated with writing TA diminished over the 15 week period even though the difficulty and task demands of the content actually increased each week. This result is consistent with the results that have been found in the hardiness training and resilience development literature over the past 20 years. This first study was more or less a template for the next studies I did including the current one.

4.0 The Next Study

The effects of the Take-Away was next examined in suburban High School IE Physics and Physical Science courses for a 6 week unit on Newtonian mechanics in 2010 (see Carifio and Doherty, 2012). This particular context was chosen next to study the effects of the TA technique as very little is formally known about the effects of "writing activities" of any kind by students in STEM courses and physics courses in particular (see May and Etkina, 2002). The suburban high school was large and in the Northeast. The study involved 6 high school physics and physical science teachers and 274 eleventh and twelfth grade students, and it focused on the students' understanding of Newtonian Mechanics using the Force Concepts Inventory (Hestenes et al., 1992), the Mechanics Baseline Test as a covariate (Hake, 1998), and the Colorado Learning Attitudes about Science Survey (Brewer et al., 2009) as measures of effects and covariates. There was an experimental and control group in this second study. Both the experimental and control group received the same IE instruction treatment (except from different teachers) that only differed in one respect. *In the experimental group, students wrote a one-half to one page "bullets-form" Take-Away for each class that summarized the key points relative to the concepts and principles that were covered in the class, whereas in the control group* students wrote *a one-half to one page evaluation of what they liked and disliked about the class, which was a "control" reflection and a "control" summarizing (experience) that also kept the amount of treatment received by each student constant.* The unit on Newtonian mechanics was six weeks long or roughly half a semester.

The experimental (TA) group performed better than the control (RW) group on all of the standardized achievement measures using Hake normalized gain scores by *a quarter to two-thirds of a standard deviation*, which is a very large effect for the TA technique, given that minimal to no feedback on the TA's students wrote were given. Neither group showed the typical decline in attitudes towards Physics that typically occurs in IE approaches. The experimental (TA) group students gave the same positive benefits for the Takeaway technique as given by college undergraduates in a previous study done with those students in the control group citing much lower rates of these benefits and primarily emotional expression benefits as would be predicted from TA theory.
The increased achievement observed in this study could be attributed **directly** to the Take-Away technique as opposed to other rival hypotheses or techniques like reflective writing or journaling. *The Takeaway technique (and its effects) was found to be clearly distinguishable from the alternative writing technique used,* as it should be according to its theory, and this result was the most important finding in this second study, even though the positive and negative reasons given in the first study were replicated in this study for 274 high school students.

Another important findings of this study was that *female students* in the TA groups did significantly better on the achievement measures than the females in the control "evaluate instruction and your feelings" groups and as well as the male students in the control group and almost as well as the male students in the TA group. This finding was strongly supportive of the call for new strategies to improve the achievements of female students in physics (see Hoellwarth, 2005; and Loerenzo et al., 2006 for details). However, this finding also indicates that the Take-Away technique not only helps student to form new well-formed knowledge schemas, but it can also help them to **express** their understandings of the subject-matter content in ways that are not traditionally practiced, assessed or used as assessments in a particular subject-matter area. To underscore this point, the TA technique has been informally used in introductory computer programming courses with undergraduates with very similar results with novice programmers and female students being most helped and instructors able to catch critical misunderstandings, misconceptions, and lack of basic knowledge within a few days rather than weeks later when they are far more catastrophic.

Writing computer code has many similarities to writing expository text, with both reflecting (or not) coherent knowledge and understandings at different levels of sophistication and achievement (see Pinker, 2008 for details) and a range of meta-cognitive, organizational and self-management skills, and communicating in a manner that the communication is comprehensible to another person or the compiler of the computer language one is writing the code in. And both types of meaningful communications either 'compile and run successfully" or not, indicating that there is an external and somewhat fuzzy objective "Turing" test of the adequacy and meaningfulness of the communication relative to the subject-matter, content, or academic discipline it encapsulates, conveys, and represents.

5.0 The Current Study

The current study focused on using the Takeaway technique in an *online* graduate course to see how it would work and what its effects would be, and particularly as compared to face-to-face classroom instruction. A broad array of studies of the many and various problems students have in learning in online courses (e.g., Shea et al, 2012; Chu & Tsai, 2012; Stodel et al, 2006; Heckman & Annabi 2005) strongly suggest that the Takeaway technique should in theory impact dramatically and reduce if not ameliorate many of these different difficulties. Among these difficulties are poor time and self/learning-management, poor study skills and readiness factors relative to learning in an online environment, a lack of meta-cognitive and self-discipline skills and strategies to successfully cope with many aspects of online learning, a propensity to shallow knowledge acquisition and understanding expressed in fairly truncated, abbreviated and quite often passive ways due to various aspects of the medium and online course software (see Parker et al, 2011; and Bore, 2008 for details). Carr (2011) has written extensively and eloquently on the relatively low-level information processing, achievement and cognitive functioning that occurs and is *de facto* promoted by all social media and online learning software, as encouraged, practiced and usually done today, and his metaphor of social media and online learning as basically being and creating *"The Shallows"* is not only profound and powerful, but also *literally correct,* as numerous studies cited by Carr (2011) and elsewhere have shown (e.g., Liu and Ping, 2009; and Bodanik, 2012).

Then, of course, there are a variety of other negative online learning effects that stem from pronounced isolation and a type of depersonalization and anonymity coupled with high de-contextualization of information and events and an on-going absence of visual, tonal, and real time information, (as compared to the face-to-face classroom) that interfere with learning and deep understanding (see Liu & Potenza, 2013; Price, 2011; Aboujaoude, 2010 for but a few examples of studies and Carr 2011 for many more). These points are not to say that similar isolation and depersonalization cannot or does not occur in face-to-face classes, but only that these kinds of events and behaviors tends to be more muted and infrequent as they are usually observable more quickly and there are usually more circuit breakers built in to check for and disrupt these behaviors than in typical online learning contexts and courses. The affective components of learning tend to be very much more ignored in online learning as compared to face-to-face learning (see Means et al., 2009 for details), as the student and students are *literally not present* and thus "out-of-sight," and many important problems and variables, therefore, tend to be "out-of-the-minds" of online instructors and theorists.

Even if the relative percentages of students with these problems are comparatively low and only 5% or so of a group, these "marginals" (as they are called in statistical analysis) will be the difference between overall *group* success or failure. These students will also "drive" course dynamics positively or negatively in most cases. The importance of "the marginal students in a group" and "marginal differences" when it comes to instruction, learning, and education is a point that is not well understood in many areas of education, but it is particularly misunderstood and overlooked by advocates and enthusiasts of online learning and instructional software packages. The "margins" along with individual differences are actually what make or break an instructional approach or innovation in terms of success and particularly in terms of statistical results in a great many cases. Therefore, attending to and managing "the marginals" is always important in instruction but attending to and managing "the marginal" are particularly important in online instruction to keep them (when they are negative) from growing to 10% or 15% of the group or greater in the first third of the course, as they may not be correctable after that,then progressing to even higher failure or low success rates due to the somewhat "peculiar" or atypical nature on online learning as compared to face-to-face classroom learning. I have characterized online learning as "maze learning," and "maze reading and maze information processing."

I use this (vivid and visual) *metaphor* not only to describe key characteristics of online learning and how many students wander around in "online land," but also to communicate Tolman's (1948) central and paradigm changing insight 70 years ago that mazes and maze learning approaches are cognitively "disintegrating and isolating" in terms of coherent knowledge learning and understanding. Rather than "integrating and networking" knowledge and understanding, mazes jumble both often severely. The learner tends not to develop appropriate "cognitive maps (i.e., schemas)" of the subject matter and content to be learned, and particularly so when there are no regular events to force the learner to induce and develop such cognitive maps and schemas, which is the whole point of academic instruction and academic instruction in a higher education as opposed to other (more elementary, corporate or vocational) setting. I am using a strongly suggestive set of metaphors here to quickly and vividly communicate a number of aspects, dimensions, characteristics and qualities of online learning as a *learning medium and environment* as compared to alternative learning media and environments and various hybrids of both. These strongly suggestive metaphors are also being used to help people view online learning from a strongly cognitive view point and learning theory paradigm as opposed to the dominant behaviorist paradigm from which it tends to be viewed and practiced with that viewpoint built right into the online software platforms available for professors to use such as Black Board and others including Ed-X. There are the numerous problems and difficulties using online instruction relative to students acquiring *well-formed knowledge structures and higher order achievements of various kinds, which is the whole reason d'etre of higher education in the classic as opposed to the corporate sense of the term.*

Little research has been done on the quality and character of knowledge-structures students acquire via online learning, or the quality and nature of the higher order learning and understandings they acquire, which is one of the foci of concern in this study. Whether the Takeaway technique can inhibit or at least diminish many of the negative effects and outcomes that have been documented relative to online [maze] learning while at the same time developing the cognitive and meta-cognitive skills, knowledge, understandings, and strategies students need to successfully achieve higher order subject-matter learning online is the second foci of this study. If the theory of the Takeaway technique is reviewed, and particularly in it detailed explication in the earlier studies and articles, and the evidence of the first two studies are used, then it will become apparent that all of the skills and active and self-managed learning that the Takeaway technique is directed at developing should act to diminish "bad online behaviors." Next, the ways in which the Takeaway technique **unobtrusively** manages the learner and places the learner in a continuous double-bind and anxious condition that requires the learner to pay attention and actively extract and create key meanings and key messages from interactive instructional exchanges will or should have a particular important effect in an online learning environment. That particular effect will be to continuously facilitate the learner from not lapsing into all of the "bad online behaviors' that are continually cited in the literature as detrimental to successful online learning and learning experiences.

The Takeaway technique unobtrusively demands and requires that the online student **a**ctively extract and create the meanings and messages of the learning exchange with a "looming and more than minimally stressful production and performance deadline" out there at the end of the week. The *student* must figure out and create the "gist" of the meanings and messages in the exchange and then must formulate them into a form that can be communicated to others. It is the *student* who must actively organize and sort out the meanings and the messages and elaborate them and organize them into wholes and schemas that may be expressed to others and are in a form that is more amenable to being incorporated into long term memory. One of the major problems of current online learning models and theory is that the prevailing zeitgeist in online learning see all of these aforementioned behaviors as being *the responsibility of the instructor or the instructional agent* as opposed to the students and it is the transfer of these basic responsibilities to the instructor and instructional agent that is one of the root causes of many of the problems observed. The Takeaway *intentionally* acts to inhibit student passivity and learned helplessness as it *transfers the responsibility* and task of extracting and organizing the meanings and messages of a presentation or exchange back to the student and makes the student actively do these key cognitive tasks and processes fairly continuously at some level and actively practice them with each exchange. The Take-Away technique, therefore, focuses on building **online** learning character and responsibility, and the theory predicts that student (online) learning and particularly higher order learning should increase over time as this process takes hold and the learner develops and employs all of the needed "takeaway habits."

5.1 Methodology

The methodology used the current study was essentially the same as the methodology used in the first studies done of the Take-Away technique described above. The online graduate level theories of learning course that was the focus of the current study was a highly demanding course in theories of learning that covered all four of the current major learning paradigms and theories of development as well. The Takeaways were due each Sunday evening and included all readings, assignments, online discussions and chats and they counted for 20% of the students' grade. Again and for the reasons previously stated students were given virtually no to minimal feedback on their TA after the first few unless they specifically asked for it and then the only feedback given was very generic and general such as "Your TA is both adequate and acceptable," or "The TA's you are writing are showing improvement" or the opposite of these two types of positive feedback. Again, the TA's that the students submitted were continuously monitored each week in the manner and for the reasons stated in study 1 above. Again, after the first few TA's, these students were both fairly conscientious and serious in terms of producing TA's that meet all of the stated criteria. The students in this course were a mixture of certificate, masters and CAGS degree graduate students from different areas of education and some from outside of education who had differing experiences with online courses and different levels of prior preparation in the theories of learning content. This fact allowed for these kinds of differences to be examined in the results, but it also meant that students who were highly schooled in one learning paradigm such as ABA behaviorism could be assessed in how they assimilated and accommodated the other major paradigms taught in the course and particularly the cognitive/information processing paradigm.

The data collected in the current study was collected from *two different groups of graduate students who took the course a year apart* and thus the data and the finding of this study are replicated across several factors of importance. There were 19 students in the first group and 24 students in the second group for a total of 43 students in this study. There were three essay exams in the course, as in the first study reported above, which again allowed for the assessment of learning and higher order achievement and how it evolved over the course, and the first question on the third exam asked students to describe and rank order what they found positive about the Takeaways they had to write (and why) and what they found to be the negatives of writing Takeaways (and why) and what they would do to correct the negatives. The positive and negative reasons given by students were again independently coded by 2 reviewers using the same theory-based topology used in the first and second study and again the inter-rater agreement percentages where close to 100% with discussion being used to resolve differences. There were, however, some significant differences in this study as compared to the first study done which was done with undergraduate students.

5.2 Higher Order Achievement Enhancement

The quality of student Takeaways online, using a simple four level scoring rubric, predicted essay exam achievement (letter grade) at r= +.62 across the **3** exams with students being positive about the technique *by the first exam* rather than *the end of the* course as in the first study. This level of correlation was significantly greater than in the first study (r=+.45), but as no prior achievement and abilities level data could be obtained on these graduate students such as GPA or GRE scores, it could not be determined if takeaway and essay exam performance was independent of these abilities factors, as in the first study, or if the abilities of the graduate students in the sample in this study was similar to the abilities levels of the undergraduate students in the first study. Students reported that the TA's in general 'grounded' them in the course and had them continually checking the quality of their learning and understandings. Students reported that the TA's kept them focused, disciplined, attentive, on schedule and more aware if they were connected or not and progressing and developing as they should be according to their own estimates of getting confused, sidetracked, behind and lost or isolated somewhere in the maze of the content, assignments and different learning paradigms. Most students saw the TA's as a method and strategy for managing the various complexities of the course and the content, and this ongoing management function was particularly so for the less well-prepared students at the lower degree levels, a finding that was also observed in the first two studies. The quality of online student responses to essay exam questions again *improved remarkably* over the semester in a non-linear fashion with the "take-off" occurring again on the second essay examination. The repeated measure ANOVA with trend, $F_{(2, 43)} = 14.1$ which accounted for 32% of the variance was greater in this study than in the first study where 24% of the variance was account for in the improvement trend across essay exams.

These achievement results were consistent and the relatively same for each of the two online groups in the current study, and this general consistency between these two groups doing the same online theories of learning course a year apart was observed on most findings in the current study. Given the higher order achievement results of the first study and those of this study and the fact that the Takeaway technique improved higher order high school physics achievement comparatively in the second study by one quarter to one-third of a standard deviation unit (effect size), it would seem warranted to say that the Takeaway technique substantially increases higher order achievement in the learning of subject-matter content. Even given all of the noise and critical variations that are part of these three studies, this improved higher order achievement finding is a strong exploratory generalization and formative "meta-finding."

It also seems warranted to say at this point that the higher order achievement effects for the Takeaway technique *is most probably stronger in online courses than in other instructional contexts*, even given the fact that the criterion measures cannot be directly compared or expressed in a comparable metric or the samples said to be comparable or equivalent. This particular tentative generalization and claim is being made here based on the logical points and grounds that the graduate students in the online course in this study should be more cognitive and meta-cognitively developed and skilled than the undergraduates students in the first study and the high school students in the second study and thus logically the higher order achievement effects of the Takeaway in this study should logically have been *less* than in the first study rather than greater. Although cognitive and meta-cognitive developmental levels were not measured or assessed directly in any of these three studies, the research literature and logic-in-use strongly suggests that the effects observed should have been less rather than more in an online graduate course, even though the students in the course were at three different graduate levels. Further no great or consistent differences were found between students at the different degree levels in either online group or by level of prior online course experience or prior subject-matter preparation. Again, these findings are suggesting that the higher order achievement effects of the Takeaway technique may be stronger in an online instructional context than other contexts, but these are points where further and better controlled confirmatory studies are obviously needed even though these data suggest what the results of these studies will more than likely be.

5.3 Takeaway Benefits and Drawbacks Online

When asked to list and explain the positives and negatives of the take-Away technique on their third essay exam, the online graduate students cited 86% of the possible benefits they could maximally state given the format used *with 84% of the benefits cited falling into the comprehension and retention enhancement categories predicted by Takeaway theory as the primary benefits the technique should achieve.* What was even more interesting is that online graduate students' views about the benefits of the Takeaway technique were much more homogeneous than the views expressed by undergraduate and high school students in study 1 or study 2, even though they were more heterogeneous as a group than these latter students. Many of graduate students said that doing the TA's even without feedback increased their motivation to carefully do the reading each week and write a TA for themselves that gave them a sense of pride and achievement in having written. Other online graduate students lauded the TA technique because it helped them to create their own personalized and customized study guide that they used in many different activities including participating in online discussions. Other online graduate students said that they liked the TA's because it left them knowing exactly where they were each week in the course which made them feel less isolated, alone or out-to-sea in the course, which was a high demand course. By about the fourth week of the course, most students were writing two to three page TA's even though only one page was required and by the end of the course most students were writing 4 to 6 page Takeaways and even adding in charts and diagrams on their own which were not required.

This same type of growth also occurred in the online discussions each week by these online graduate students. Online discussions increased in length, sophistication and complexity over the 15 week course and numbered over 3,000 postings for the course in both years in terms of public discussions, with many posting being a couple of well-constructed paragraphs by the end of the course on average. A more sophisticated analysis on these online discussions and the evolution of the TA's written by students in terms of coherence and complexity of writing and understanding is currently being done. Online graduate students stated only 44 out of a possible 129 "negative problems" with TA's they could have stated (52%). In fact, only 33% of online graduate students stated a third negative about TA's. Again, the negatives of doing TA's were far fewer and more homogeneous for graduate students in this study than for undergraduate or high school students in the prior two studies.

The cognitive load and stress items that were reported by graduate students in this study as negatives of doing TA's were reported primarily by the certificate and some masters degree students in the course who were also less prepared to take the course. Cognitive load issues and stress were to be expected, but one will have to decide if the negatives stated about TA's by these online graduate students are typical or atypical of what will occur using TA's online and this is a finding that really needs replication. However, the trend does seem to be that there are more benefits and fewer negatives of TA's as one progresses from the high school to the graduate level which is a finding predicted by TA theory.

6.0 Summarizing Students' Perceptions of Take-Aways in the 3 Studies

Table 1 compares the positive benefits given by students of doing takeaways as a percentage of the benefits stated in the three studies done. As can be seen from Table 1, 73% of the positive benefits stated by students were predict by Takeaway theory as being the primary benefits that should occur with 23% of the positive benefits stated being predicted secondary benefits of the Takeaway technique. The positive benefits of using the Takeaway technique stated by students were roughly the same across the three very different contexts that the technique was used in and again it should be clearly noted that the most minimum form of the TA with no feedback was used in all three studies to obtain this baseline. In a word, effects and results should only *increase* from this baseline.

Table 1: Comparison of Students' Perceptions of the Positive Benefits of the Takeaway Technique by Study by Percentages of Benefit Stated by Theoretically Predicted Primary and Secondary Benefits that should be Observed

	Study 1	Study 2	Study 3	All Studies
Predicted Primary Benefits				
Improved Comprehension	46%	46%	51%	47%
Improved Retention	29%	25%	22%	26%
Total Primary Benefits	75%	71%	73%	73%
Predicted Secondary Benefits				
Study Skills Improvement	17%	15%	17%	16%
Expressive Skills Improvement	8%	15%	10%	11%
Total Secondary Benefits	25%	30%	27%	27%

Study 1 was 30 undergraduate students Cognitive Psychology course
Study 2 was 274 high school students Newtonian Mechanics Units
Study 3 was 47 graduate students in an online Theories of Learning course

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Table 2 presents the negative aspects given by students of doing takeaways as a percentage of the negative aspect stated in all three studies done to date. As can be seen from Table 2, in all three studies students only cited 50% of the negatives that they could have stated given the format used, whereas students stated 97% of the possible positive statements the format allowed them to make. It should be noted that positives benefits outnumbered negative aspects 4 to 1 and the percentages between the two are not directly comparable. However, the negative aspects were fairly consistent across the three studies and pretty much what was expected from both TA theory and the methodology (called destructive testing) that was intentionally used to estimate a variety of things about TA's and their down sides. The level of perceived cognitive load was higher than expected, but the data in all three studies strongly suggests that this may be due to the initial demands and struggles of learning a higher order process of information processing and functioning while at the same time unlearning many accumulated bad habits. The cognitive load problem or issue should lessen considerably over time as the TA mode of functioning becomes more developed and automatic and a learning habit.

Table 2: Comparison of Students' Perceptions of the Negative Aspects of the Takeaway Technique by Study by Percentages of Negative Aspects Stated

	Study 1	Study 2	Study 3	All Studies
Negative Aspect				
Burden/Inconvenience	18%	41%	25%	31%
Cognitive Load	41%	31%	42%	36%
Lack of Needed Skills to Do	0%	7%	0%	5%
Mechanics	31%	15%	33%	28%

Note Well: in all three studies students only cited 50% of the negatives that they could have stated given the format used whereas they stated 97% of the possible positive statements the format allowed them to make. Positives benefits outnumbered negative aspects 4 to 1 for the percentages between the two are not directly comparable.

Study 1 was 30 undergraduate students Cognitive Psychology course
Study 2 was 274 high school students Newtonian Mechanics Units
Study 3 was 47 graduate students on line Theories of Learning course

Various other aspects of the negative aspects of using Takeaways may be fairly easily ameliorated or eliminated and in the myriad ways that the students in these three studies identified themselves ranging from doing TA's every other week or on one focused part of the course (e.g., outside reading) until the skill is developed and, of course, receiving feedback on one's TA even if from other students. The lack of feedback was intentional in these three studies to see what effects would be obtain if the instructor did nothing more than require that the students do the TA's to the specifications set and to keep the amount of 'treatment' students received in each study fairly constant. These 3 studies have shown that if the instructor does little more than assign the TA's as a requirement higher order achievement increases as well as many other positive effects and particularly in an online course as the TA provides and builds in *unobtrusively* structure and discipline and a performance periodicity and style that is important and regularizing. The benefits for graduate students, given that so many of them are such poor writers today, are also immense in terms of learning to do expository and scholarly writing in small bite-size and consistently periodic experiences before they have to "eat the elephant" of a thesis or dissertation. All kinds of qualitative and informal data emerged from this study on how more confident many of these graduate students felt about their ability to do graduate work.

7.0 Proof of Life and Checking Students' Vital Signs

Herbert Marcuse (http://www.marcuse.org/herbert/) was famous for the numerous ways and strategies he had for periodically checking students' *"vital signs"* to see if they were indeed alive as opposed to "corpses," or just "reactive and/or passively responding corpses." What Marcuse sought continually and constantly checked for in students was *"striving speech and responding of various kinds"* (see Carifio, 2008 for details). What quickly became apparent to me in moving the Take-Away technique to an online course over and above everything else that has been said about them above was that they quickly and easily implemented a simple and missing *"proof of life"* component to instruction and a weekly checking of students' *vital signs* relative to their processing and understanding the content to be learned that week, as well as their ability to summarize and express that content well and professionally (or not). One could quickly see who was floundering how (or not) each week and the same for the group as a whole, and each TA and week were 'windows of opportunity' for intervention and particularly 'higher order' inventions each week, which unfortunately could not be capitalized on in *this study* so that its conduct and results would be consonant with *the prior two studies* comparatively and in terms of establishing baselines and needed experimental controls.

But it was in the conduct of this study and reading students' Take-Aways in the same course two different semesters that this function of TA's in online instruction became apparent to me and how TA's checked students' vital signs weekly and provided "proof of life or not" readings in a simple, easy, relatively low key and efficient way that also helped students to learn. The potential TA's provide for interventions and the shaping and steering of learning and development also became apparent to me, as did the increase work load such interventions would bring instructors, and particularly without the assistance of new software and technology which would automate at least part of the process of giving students feedback on their TA's.

Software that assesses levels of understanding and levels of achievement rather than "form" and the mechanics of writing (which is about all that current "text scoring" software can do) is still, unfortunately, a long ways off. Better "texting scoring" software is most definitely a direction for further research and development, as well as increased attention to this missing component in online instruction as well as in live-class instruction as well. But using TA's for quick checks of students' understanding and achievement vital signs (individually and collectively) and "proof of life" is something that can easily be done now without much increase in teacher work load or burden and, as has been established in 3 separate studies from high school to graduate school, one gets improved understanding and achievement levels using Take-Aways even if you give student little or no feedback at all on the TA's they write. Lastly, graduate students acknowledged that being forced to stay on their toes all week and to sort it all out at the end of the week rather than later was exactly what they needed to be required to do and it picked up their performance and achievement and kept them doing their work in a steady and consistent manner as they knew that TA was "there" and due Sunday night and if they were late or/and cutting corners it would show up like a *missing digital thumb*. One could zone out and give low ball and shallow responses on discussions and assignments in the module for the week, *but not the TA* and that became quickly apparently to most students. The TA required that you show *proof of life* and it gave a reading of students' higher order learning vital signs each week and that may be the component and characteristic of Take-Aways that was discovered more clearly in this study that should be focused on and developed in more depth and detail both theoretically and practically as an 'achievement enhancer" in all instructional modalities.

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