Assessments of the Third Kind – Do graduate research students change their perceptions of research barriers from the beginning to the end of a graduate course in research strategies?

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Abstract

Available assessments of our graduate research strategies course were (i) traditional pre- and post-test evaluation instruments, and (ii) student evaluations. We felt a need for a third kind of assessment to measure any changes in attitude to research, though we did not expect detectable changes in a 15 week course. Students were asked to rank their perceived barriers to research in a research barrier questionnaire, issued to them at the beginning and end of the course.

While attitudes usually change slowly, we did detect a statistically significant difference in the mean rankings of the two constructs 'procrastination' and 'framing hypotheses' at the 5% level. Surprisingly these constructs were *more* firmly embedded by the end of the course. We were comforted by Festinger's (1957) Cognitive Dissonance Theory which has been modified to say that attitudes may change quickly when people are confronted by the reality that they are 'wrong'. Suggestions were made for improvement of the barrier questionnaire and the research strategies course.

Introduction

Assessments of the First Kind

When it came to evaluating students taking a graduate course on research strategies in education, we had only two kinds of assessment. The first kind was a traditional period of teaching, symbolized by X, followed by a post-test observation, symbolize by O.

The evaluation design was therefore represented by

X O

In teaching and indeed in research, this design is recognized as faulty, because it does not determine the entry behavior O1 and readiness of the students to receive the treatment X.

Evaluation should be a two part process (i) determining the degree to which objectives are obtained, and (ii) comparing the performance against norms. If the objectives are strictly-behavioral, specifying entry behavior and expected terminal behavior, the X O design needs additional pre-testing of the students' entry qualifications and experience. Then this improved design would be represented as

O1 X O2

Many times we can be excused for using X O. We all have to teach 'too soon', before we have sufficient information about our students. As early as 1800, Dr. Caleb Parry said that it was much more important to know what sort of patient has a disease than what sort of disease she/he has. However, because of pressures of the national curriculum, sooner or later we have to get on with the job of delivering X.

Assessments of the Second Kind

In addition to the cognitive evaluations, we were asked to acquire student evaluations. These immediately make incursions into the affective, psychomotor and conative domains. Examples of affective evaluations are those which accept or criticize the workload, draw attention to conflicts between work and family, and refer to the quality of teacher charisma and interaction with students. Psychomotor evaluations may refer to lack of, or difficulties with, transport to and from the class, particularly in bad weather, or disabilities such as carpal tunnel syndrome. Conative (or 'action') evaluations may refer to procrastination, Types A and B Personality problems, or resistance to relinquishing the comfort zone of the classroom to go out and obtain a research sample. Student evaluations provide beneficial opportunity for the students to give vent to their frustrations, but in the worst scenario the worst students give the teacher the worst reports, as excuses for their own laziness.

Can we do better than assessments of the first and second kind?

For the first kind, we can add a cognitive pre-test to the X O model, elevating it to

O1 X O2

This is rather harsh, because it will be exposing gaps in entry knowledge rather than motivating the students to start the course. We tried to mix the pretest with steerable student introductions. Given a free rein, naive students would talk freely about themselves, whereas more sophisticated students had learnt to be cautious in introducing themselves, and confined themselves to describing their cognitive achievements. By imposing structure and cues, they could be

encouraged to open up in the affective domain, for example saying whether they were shy or confident, introverted or extraverted, even sexual or sensual. In the psychomotor domain, unless they were physical education students they rarely revealed whether they were team or individual players. To enter the conative domain, they needed yet more encouragement to say whether they were procrastinators, or Type A or B personalities.

While we learnt a lot about the students from these revelations, for this particular course we felt a need for a third kind of assessment, combining evaluation of ourselves and the students. The course had less content than skills because it aimed to provide the students with transferable research strategies to use later in teaching and counseling occupations or in doctoral research. A conative aim was to encourage students to exercise creative and divergent thinking to solve problems in action research – an ambitious aim if they had been the victims of much rote learning in earlier education.

Literature Review

The closest research of our concerns was an article titled "What Today's College Students Say about Conducting Research in the Digital Age", by Head and Eisenberg (2009). They conducted their research during the fall semester of 2008. They instigated eleven discussion groups on seven college and university campuses across the United States. They talked with 86 full-time students studying the humanities and social sciences in private colleges and universities, public colleges and universities, and community colleges. In their discussion groups they heard first-

hand accounts about what conducting research means, what the stages of research entails, and what techniques, strategies, and solutions students apply throughout the process. They found that no matter where students are enrolled, no matter what information resources they may have at their disposal, and no matter how much time they have, the abundance of information technology and the proliferation of digital information resources make conducting research uniquely paradoxical: “Research seems to be far more difficult to conduct in the digital age than it did in previous times”.

As some of the students in our class agreed in cohesion with the students in this study, research surprisingly seems to be far more difficult to conduct in the digital age than it did in previous times (Head & Eisenberg, 2009, p. 2).

In this study Head and Eisenberg also addressed factors of course-related research versus everyday life research. Course-related research coincides with your projects and classes and a topic you are researching. However, in everyday life research you are for example searching home remedies, the weather, where to travel - things that are usually more pleasing for people to research. Head and Eisenberg (2009) stated that they have identified four types of context that students reported they tried to obtain during the research process. These contexts are (1) the Big Picture, (2) Language, (3) Situational, and (4) Information-Gathering. They said that the Big Picture context involved selecting and defining a topic, understanding multiple sides of an argument, and figuring out how the topic might best fit into the course curriculum. In was also stated that in many of the settings the students had different library facilities to go to; however, the students had said that a lot of times they weren’t sure what to cite. Head and Eisenberg (2009) recited the Language context involved obtaining the meaning and use of language as an essential context in the research process for either course-related or everyday life research. The

Situational context involves setting the parameters of a topic, especially how efforts may fit into expectations and a set of surrounding circumstances. Then the last type of context they reported was the Information-Gathering context that involves finding, accessing, and securing relevant research resources that "satisfies" individual research needs. The students reported being overwhelmed and many were procrastinators by nature. One of the strategies talked about was using the reference librarians because they could help pinpoint what you needed to find in a book, finding a particular book or articles online. Some students even referred to reference librarians, as "sense-makers", because they even helped to make the project/research and research results make better sense to them. Students even reported as using Wikipedia as a starting off point in their research because it could give you other ideas that were related to the topic, or to get your wheels turning on the subject, where before they couldn't get a head start.

Overall, Head and Eisenberg (2009) summed up their findings –

> "The students reporting to be challenged, confused, and frustrated by the research process, despite the convenience, relative ease, or obliquity of the internet. In their discussion sessions, frustrations included the effects of information overload and being inundated with resources, but more. Participants also reported having particular difficulty traversing a vast and ever-changing information landscape. Specifically, participants greatest challenges were related to finding the materials they desired, knew existed, and needed on a "just in time basis"

The overall nature of the research done by Head and Eisenberg and ourselves shows that research today, in the digital age, is very confusing, frustrating, and difficult with the perceived

and unperceived barriers entailed, and that some professors don't forecast the troubles likely to be encountered by the students doing the research.

A national survey conducted by Perl and Kahn, (1981) found that demands of jobs, problems of learned models of research, or a shift of interests may affect subsequent research output. These two citations triggered the idea that we ought to determine the perceived and real barriers of the students to effective research. Dare we look for changes in attitude over the relatively short time windows of our 5- and 15- week research courses, knowing that attitudes change so slowly unless we are subjected to shock, or brutal life changes such as bereavement?

There is some hope that attitudes may change if people clearly know that their present attitude is 'wrong' for achievement of a highly desired goal. As early as 1957 Festinger developed his Theory of Cognitive Dissonance (Festinger, 1957). The theory is validated by withstanding the test of time. As a Construct, Cognitive Dissonance is best understood by an example – suppose you decide to buy a Chrysler instead of a Pontiac. You then avoid Pontiacs until the Chrysler is yours. Dissonance is rooted in unpleasant feelings when your belief contradicts your decision. Festinger's research progressed to discover that dissonance would in fact change attitudes over time, helping people to justify their decisions or actions even when they knew they were wrong.

Secret, Ford and Rompf (2003) revealed complex student attitudes towards learning research strategies, using a large sample over a long period of four years. There was a mixture of positive and negative attitudes and an initial fear of statistical analysis.

Fortunately the research experience of our own team linked to the clues in the previous citations to provide an assessment of the third kind -

Cleeton G. (1991) published a Ph.D. thesis ‘ Towards a new theory of learning barriers’, in which he classified perceived and real learning barriers, though this was focused on an Electronics course which targeted content rather than skills. He followed this up with an article in Perceptual and Motor Skills (Cleeton G., 1996) in which he generalized the theme by developing a terminology for learning barriers as *perceived*, *anticipated*, *real*, *illusory* and *discovered.* Perceived barriers are those which are felt almost by intuition before a course starts. They are often scars from previous experience. They firm up to become anticipated barriers. Hopefully they do not gel to the extent where Piaget in discussing anticipatory images said that anything we anticipate is more likely to occur.

As a course proceeds students may find their perceptions and anticipations realized as *real* barriers, or hopefully dispelled as *illusory* barriers. Persistence of the *real* barrier consolidates it as a *confirmed* barrier. The worst barrier you can encounter is the *discovered* barrier, which was neither perceived nor anticipated. Recalling our earlier critique of Head and Eisenbergs’ report (2009) we noted reference to *unperceived* barriers, analogous to Cleeton G.’s *discovered* barriers.

Another of our research team was a graduate (Eberle, M. A., 2009), who enrolled in our course in research strategies, and expressed a desire to submit her research project on its evaluation. To her we are also indebted for her acquisition and critique of Head and Eisenberg’s article.

Our third member of the team (Cleeton, L., 2003) clarified problem solving to surmount blockages in the action research process. She had published doctoral and post-doctoral research on external representations by enhancing their actions in the conative domain. This was done by recording the ‘rough work’ done in solving spatial problems. She was able to illuminate the team

experience by steering our content-based research into strategy-based research. In this connection, Johnson (2009) has published a valuable book devoted entirely to action research by teachers in schools.

Collecting these critiques and team experience we attempted to fill a gap in evaluation by making an assessment of the third kind, in which we would determine student attitudes at the beginning and end of the course and try to detect any possible shifts, though we expected these to be small, if they existed at all.

Research Question and Hypotheses

Do graduate research students change their perceptions of research barriers from the beginning to the end of the course?

Alternative hypothesis – Research students will change their perceived learning barriers to research during a 15 week course on research strategies

Null hypothesis – There will be no significant difference between the perceived learning barriers of research students to research from the beginning to end of a 15 week course in research strategies

Research Design

First it was necessary to collect perceptions of barriers to research. Over a period of eight years, anecdotal impressions of these barriers were collected. Seventeen of the most frequent

perceptions were listed. The students were asked to rank these at the beginning and end of the course. Open-ended questions were added to the ranking list to ask for any other perceived barriers and perceived strengths for research. The final barrier questionnaire follows -

Research barrier questionnaire.

Rank these perceived barriers to research - '1' for greatest perceived barrier

	'Writers' block'
	Procrastination – delaying work
	Re-writing
	Editing
	Sentence construction
	Choosing a project
	Searching the Literature
	Framing your objectives
	Prioritizing objectives
	Framing hypotheses
	Keeping the whole project in mind while focusing on part of it
	Getting a sample
	Matching learning style to the project
	Time management
	Constructing measuring instruments – questionnaires, tests
	Statistics
	Graphics

What other barriers do you think you will have?

What are your strengths for research?

Sample

The barrier questionnaire was completed anonymously at the beginning and end of a 15 week course on research strategies by 19 graduate education students.

Analysis of results

Descriptive statistics

The plan was to examine the mean barrier rankings of the perception constructs and give a general description of most and least perceived barriers.

A correlation matrix was to be examined to look for distinction or redundancy of the barrier constructs. This means for example that if there were a high, significant positive correlation between constructs X and Y (for example ‘rewriting’ and ‘editing’), that these constructs would be so highly related that one of the constructs was redundant and could be pruned for a future questionnaire. Such processes had already refined the questionnaire to its present state.

Inferential statistics

The plan was to look for significant differences between the mean ranking of each construct at the beginning and end of the course. Preliminary measurements of skewness, kurtosis and variance of each construct pair (that is, for the same construct at the beginning and end of the course) would be made to check for approximate normality of the distribution pairs and approximate equality of variance. If these checks were satisfied, parametric t-tests for paired samples could be applied to look for significant differences in the means of each variable pair. If not, which would be more likely since the data types were ordinal rankings not continuously interval, then the non-parametric paired-sample Wilcoxon Signed Rank Test would be applied.

Results

During the course 11 mean perceived barrier rankings were raised and 6 were lowered. A superficial conclusion would be that the course was effective in lowering barriers to research, but that depends on whether individual post-course to pre-course means were statistically significant. Since the data type was ordinal and deviated from normal, as frequently expected in a small sample, a non-parametric difference test was needed to look for significant differences between post- and pre-course mean rankings for each of the 17 perceived barrier constructs. The choice was between the paired sample sign test and the paired sample Wilcoxon signed rank test. While the paired sample sign test only uses the signs of the paired-difference ranks, the paired sample Wilcoxon signed rank test uses magnitude and sign of the paired difference ranks, so this was used.

There was a significant difference between the mean ranking of the construct 'Procrastination' from beginning to end of the course at the 5% level, but the perception of its difficulty became *worse*.

There was a significant difference between the mean ranking of the construct ''Framing hypotheses' from beginning to end of the course at the 5% level, but the perception of its difficulty again became *worse*.

These findings indicate that students finishing the course would perceive 'procrastination' as not only a serious barrier to future research, but moreover perceive it as 'worse' than at the beginning of the course! The same applies to 'framing hypotheses'.

Discussion

While it is always encouraging to find any statistically significant research results, they do not always go in the expected direction, but further examination of these often provide important insights when given careful consideration. At first it looks as though the course, or the action research conducted by the students, embedded fear of 'procrastination' and 'framing hypotheses'. On the other hand, this was the first time that the students had left the comfort zone of the classroom to go out and do action research in the schools. In our first lesson with the students, we had warned them that procrastination was the enemy of research, but this lesson may only be learned by experience. So it may be a good thing that the students came to fear 'procrastination' if they wish to do improved research in the future. After all, this course was not loaded with content, but was an introduction to research strategies.

Similar considerations apply to the embedded perception of 'framing hypotheses'.

Raising the quality of our research experiment

We can add more constructs to the research barrier rankings. These can be found in the answers to its open-ended questions. On the other hand we can prune redundant constructs from it. We made a correlation matrix of all the variable pairs and found for example that 'rewrite' and 'edit' were highly positively correlated (>0.65). Therefore we could eliminate either one of these constructs.

Raising the quality of our research strategies course

We can capitalize on the knowledge that our course does not necessarily alleviate fear of ‘procrastination’ and ‘framing hypotheses’. If there were time, maybe a course on critical path analysis would be beneficial, complete with float times at its nodes and risk analysis for non-completion. To improve the framing of hypotheses we may need to give the students more work on framing strictly-behavioral objectives.

Festinger (1957) said that although attitudes in general change slowly, one way to accelerate them is to make it clear to the student that their attitude is ‘wrong’. In this course some of the students certainly embedded ‘procrastination’ as a warning for next time. However it has been said that the purpose of doing a project is to do a better one next time.

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