

ANALYSIS OF EFFECTS OF TIME AND MONEY ON THE APPLICANTS USE OF CWCS WORKSHOP MATERIAL BY PARTICIPANTS

Guergana Terzieva and Cianán B. Russell

Abstract

Research has shown the usefulness of educational development workshops. Different aspects of the workshops along with the type of material the participants apply in their curricula have been recorded. This paper focuses on the effects of time and money available to instructors in the application of material by faculty participating in workshops with the Center for Workshops in the Chemical Sciences (CWCS). CWCS provides week-long workshops centered on a topic such as forensic chemistry, chemistry and art, genomics and proteomics, and nuclear magnetic resonance. All workshops have both lab and lecture components, though their specific structure is dependent on the facilitators. The results gathered may thus be applicable to many other workshops and workshop programs. Faculty home institutions are increasing their support in the form of travel funds: 8% and 63% of the participants in 2001 and 2009 respectively indicated that they had received funding to attend the workshops. Six years after attending the workshop, 78% of the surveyed participants responded that they had applied material from the workshop in developing a new course, a lecture, or a lab.

INTRODUCTION

Literature Review

As high school diplomas lose their previous marketability, more and more students enroll in undergraduate programs that hold prospects of preparing them for high paying jobs (1). However, this diverse pool of students requires new methods for teaching. Effective instructors in the colleges and universities are crucial; they make the material they teach less challenging and more engaging to the students, who come from various backgrounds and have different majors. Currently, instructors have to fulfill new roles as course designers, marketers, technology experts, and administrators, as well as group leaders (2). Instructors, similar to the students they teach, need to constantly learn in order to keep up with new technologies and innovations. This constant improvement should address not only the course material, but also the way it is taught. Traditional methods of memorization and algorithm solving of problems are not adequate to effectively introduce undergraduates to the fields of science and mathematics due to their lack of relevant applications (3). Additionally the rule of ‘publish or perish’ is still a reality for faculty, thus continuing the need for rigorous research programs (4), (5). According to Kubins and Davidson-Shivers the working hours for faculty are raging from 47h for instructors at community colleges (CC) to 57h for faculty in research universities (RU) (5), (6). Changing curricula or teaching strategies is not easy; according to Sunal and Hodges, the common barriers to change involve time, resources, and department or institutional conflicts. Internal factors that stymie innovation in the curricula include personal resistance to change, lack of leadership skills, and lack of training (3). In the last three decades increasing emphasis on quality of teaching (4) has resulted in an increasing trend to develop and attend workshops (3) focused on curricular innovation and pedagogy.

Some universities have already created faculty development committees and have programs in place for advancing the education of their instructors. The main focus of some of these programs is teaching pedagogical skills to young faculty. While for some faculty such programs are available at their own institutions, other schools do not have them and their instructors have to go elsewhere in order to get the training they desire. Professional development workshops focus on improving working strategies in the areas

of research and teaching based on the instructors' needs by building on previous knowledge, leadership and networking. . Noted ways in which workshops have shaped the faculty are: improvement of the instructors' techniques in areas with larger and more complex areas (5), increasing knowledge of educational principles by introducing new techniques and styles of teaching, establishment of collegial networks, and positive changes in attitudes towards teaching, which result in a general satisfaction of the participating faculty (6). On the other hand, some of the shortcomings of the workshops are connected to inability to address different faculty knowledge level and attitudes (8), money required for expenses (7), not enough time to learn (8) and practice the information taught (8), lack of focus on a certain topic (), and isolation from classroom realities (7). The goals behind teachers attending workshops may be to exchange ideas, find out new activities which they can apply to class or lecture, improve their teaching style, learn more about a topic, receive college credit or fulfill a requirement. (8)

This project focuses on the effects of time and money on the participants of the Center for Workshops in the Chemical Sciences (CWCS) workshops. Some of the issues mentioned in articles that evaluate the effectiveness of workshops are already addressed by the CWCS workshops. CWCS workshops in topical areas of chemistry are appropriate for individuals with instructional roles at the undergraduate level, though select few are also allowed to participate when space is available. Previous research has found that workshops that are longer than a day tend to have more impact on the instructors than those that have the structure of a daylong conference (3). CWCS workshops are typically five and a half days long, covering in greater depth a specific chemistry-related topic. Some examples of workshops topics are Chemistry in Art, Molecular Genetics, and Forensic Science; topics that are both interesting and relevant to our lives. These diverse topics, if applied to the lab or lecture, may provide real life examples of chemistry concepts, making the subject more accessible to the students. Further, the workshops model active methods for teaching and learning as the instructors assume the role of students. The classroom environment and hands-on experiences encourage faculty to learn the material while actively interacting with facilitators and other participating faculty. The professional relationships established during these workshops can turn into a mentoring of colleagues who are experiencing similar challenges with teaching or

research. Through long term collaboration (3), coaching (8), encouragement, positive reinforcement, as well as practical and relevant feedback (3), the faculty can approve of and adopt changes to their teaching techniques. Different workshops can increase the knowledge of the faculty on the focused topic, but also on general concepts related to field of chemistry.. For example according to Schwartz-Bloom, Halpin, and Reiter, faculty participating in a pharmacology workshop felt that their understanding in the areas of biology and chemistry as well as pharmacology had improved and they had learned new material (9). This suggests that CWCS topics can positively affect a wide range of chemistry instructors by touching on many broad chemistry principles. Finally, CWCS workshops provide room and board for all participants and limited travel funds for instructors in financial need

There are numerous articles published on the subject of educational development. Their focus varies from teachers' limitations to characteristics of successful workshops. This study focuses on the effects of money and time as factors influencing the application of workshop material in curricula of the participating faculty. However, there are not a lot of sources describing these effects. According to Farmer and Gerretson, a period of gestation and sustained support further enhances the understanding of the faculty (8). We would like to find out how many years after the workshop it takes faculty to apply something from a workshop to their curriculum or research. We can further correlate these findings with networking, which can encourage the faculty to apply the material provided at the workshops sooner.

The application of the material is also affected by the perception faculty have of their own professional identity, which in turn is defined by their status in their institution (11). Additionally the way faculty is perceived by their coworkers can also affect their performance (11). Their rank and the department support they receive may play crucial role in their self-image and roles as instructors (11). Placing a reward system in the higher education institutions may result in better student teacher interactions and improved teaching techniques (12). Part of this reward system can be connected to grants, publications, and travel funding for workshops and conferences.

The effectiveness of workshops is not well described in the literature; there is no particular way to eliminate bias and interference from the results. Generally there are two

types of investigations applied to this type of research: a large-scale study of an entire program of workshops and focused case studies of a particular workshop. The large-scale approach (13) looks at general trends that can be found in an entire faculty sample. These studies can lack focus and miss important reasons behind the application of material, such as institutional culture.. On the other hand, a case study based evaluation tends to pick only a handful of instructors to investigate and thus can miss the big picture and any anomalous results experienced by a small number of faculty. The design of workshop evaluation should try to incorporate traits of these two types of evaluations. To date, evaluations of the workshops have not been rigorous enough. Most of the results come from self-reported surveys, thus allowing for bias on part of the instructors. Commonly these short surveys lack in both scope and focus required to determine the overall satisfaction of the participants (6). This study attempts to address these inadequacies in the literature as combining surveys and interviews of participants thus providing a more complete picture on the application of workshop material.

Description of Research Problem and its Importance

The purpose of this project is to evaluate the impact of chemistry professional development workshops on the teaching techniques of the workshop attendees. This training is expected to increase the quality of teaching by keeping faculty up to date on both technical and pedagogical developments (14). However, the scope of the workshop is limited by the resources of the home institution, the amount of the material that will be relevant to the instructors' course or lab, and knowledge level of the instructor on this topic. There are multiple characteristics of the workshops that can influence the instructors and a variety of articles look at lists of characteristics and their overall positive or negative effects (6). Several refer to self-image and goals of the instructor and institution (13). While this approach gives a broad generalization of the issues and benefits, it does not provide enough depth to find meaningful trends that can possibly lead to the improvement of the workshops and their expected outcomes. In this study, the effects of two of the greatest barriers to application of material - time and money - are analyzed. The questions posed are: (1) how likely are workshop participants to use workshop materials in their teaching and/or research as a function of time has passed, (2) how does financial support from their institutions affect the participants' usage of the

workshop materials , and (3) what components of the workshop experience do the participants believe the most important or impactful? are the most important or impactful to the participants? We will address these questions using statistical analysis of coded qualitative data from interviews and long- term online surveys.

MATERIALS AND METHODS

Sample

This experiment was run in the period of 2008-2010 and includes participants from a variety of institutions and backgrounds. The participants involved in this study were self-selected individuals who responded to an email invitation for participation in a phone interview and an additional email inviting faculty to participate in online surveys. The identities of respondents to both the interviews and the surveys were withheld from workshop instructors and the Center's co-directors. The research respondents were 389 individual faculty members at colleges and universities throughout the U.S. who had attended at least one of the 79 CWCS-sponsored workshops, on 28 different topics, between 2001 and 2010. These respondents represented 364 workshop attendances, as several had attended more than one workshop during the time frame of the study. They represented 22% of the 1648 workshop attendances from this period (25% of the 1273 unique individuals).

Several participants have attended more than one workshop during the history of the Center; any respondents of this type were asked to respond about each workshop separately and are treated as a separate interview for the purposes of this analysis unless otherwise stated. The first research participants responded to an email invitation in fall 2008 to participate in an interview evaluation, that is, six months to seven years after their workshop attendance. The respondent population was 43% female and 57% male, with 15%, 67%, and 14% from community colleges (CC), primarily undergraduate institutions (PUI), and research universities (RU), respectively. Respondents represented all but two of the 79 workshops conducted over the ten-year focus of the study from

which participant information was available (Metals in Biology and Lasers, which were both conducted only in 2001).

Data Collection

The main sources for data were recordings of short interviews conducted with the participants of the CWCS workshops and online surveys. The interviews were conducted via phone as the participants of the different workshops were scattered around the US and Puerto Rico. The interviews were semi-structured questions, which were separated in several general areas of interests: remembering the workshop, applications of the material, initial plans, networking experience, general satisfaction of the workshop. The reason for using a semi-structured interview protocol was to allow the participants to express fully their experiences, observations, and to provide more reliable feedback without being restricted by a certain set of interview questions. Listening to the interviews demonstrated few general trends that were further backed up by the numerical scheme analysis after the interviews were coded. The interviews were coded according to an internal coding scheme developed based on the first round of internal data. The first scheme was created using an inter-rater reliability process performed by three researchers; after the coding scheme was developed by one researcher, two others used that scheme to code 10 interviews and the codes among the three researchers were compared for consistency. When the codes were inconsistent, the coding scheme was edited for clarity. This process was repeated until 90% agreement was achieved among three researchers that took two interactions. Inter-rater reliability testing was conducted from the full audio files, not the partial transcripts. Respondents were assigned a random identification number for coding and analysis purposes; Institutional Review Board (IRB) approval was received for the study.

Additional online surveys were developed and filled with similar content to assess long-term changes in participants' use of the workshop materials. These data will be discussed elsewhere.

Data Analysis

For the coding of the data a table was developed grouping the main points of the questions asked in an excel sheet. Later the coded data was imputed in a excel sheet that was coded as a simple truth table each true statement corresponded to a 1, each false statement was a 0. Later additional analysis was performed by grouping different workshops together and recording how the participants perceived their experience at the workshop and later their application of the material. The false statements sometimes were used for further analysis such as suggestions for improvements and observation of disagreeing opinions between the different participants.

After the verbal data was transcribed and transformed into numerical that way the data could be easily treated with numeric manipulations. The coded interviews were inputted in Excel sheet the codes were treated with basic analysis which involved summing results, correlating and grouping responses based on type of workshop attended, gender, type of home institution. These codes were then cross referenced to other characteristics or responses to extrapolate correlations or general trends that could lead to factors or conditions that can influence the application of material. This data was graphed and linked to specific recommendations that may further improve the workshops and their outcomes. Outliers were further examined by re-listening of the interviews. Additional testing of the data focused on high percentage responses and their significance to the overall outcomes, the application of material by the faculty. The trends observed were meant to explain how the participants can be encouraged to bring a change in their classrooms or labs.

Once all the data is coded in an Excel sheet the answers for each response are summed thus we are able to see that the predominant trend, overall opinions of the attending faculty is towards workshop. This can pinpoint weaknesses strengths or outliers that many interviewees have observed.

Further analysis were be performed by looking at the individual workshop of the responses of the interviewed participants in comparison to all the responses. This method was used also to look for a trend over the years of how the individual workshops have been seen differently by the participating faculty; in general the workshops have not

experienced large or significant changes due the overall positive feedback received by the participants.

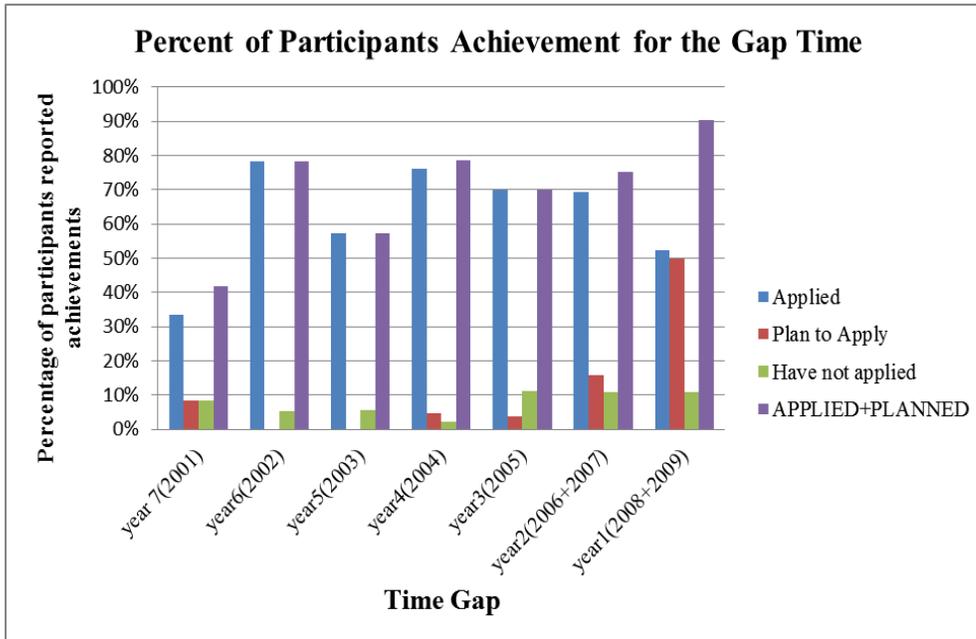
To find the people who have been influenced positively by the workshops we summed up the participants who have applied material from the workshop and those who are still planning on applying material but were unable to do so due to an external hindrance, not teaching a specific class, or not having the financial resources. Then we looked for characteristics those participants share: type of home institution, gender, what were their impressions of the workshop, if they were able to make connections with other faculty members or facilitators, whether they have received funding to attend. These and other characteristics were recorded and ranked to see how workshops have influenced the faculty as well as how the personal background of the faculty have influence the application of the material.

RESULTS AND DISCUSSION

The CWCS workshops have lecture and lab components however, the structure of the workshop is dependent on the facilitators of the workshop and on the resources available in the the intuitions where the workshop is lead. Therefore, both the sample of faculty and the various workshops are broadly generalizable because of the this variation representative of other workshops which hve similar representative of other workshops which have similar characteristics and objectives. As previously stated with the changes in technology and the student body, the roles of the faculty have been expanded thus resulting in longer week days in which they have to prepare their lectures as well as conduct research. Thus it is logical that the majority of the faculty applying the material taken from the workshops would do so after some time, as they will need to assimilate the material into their teaching. Figure 1 suggests that the greatest amount of applied material takes place within six years after attendance of a workshop. However, the majority of faculty who are planning to apply the matterial are those who had only one year gap, who remember the workshop more clearly due to the short period of time. This data can be explained as to faculty have either inadvertantly used some of the material in

their past lectures from the past. Additionally inability to apply the material may be due to scheduling of teaching assignments of certain lecture or lab.

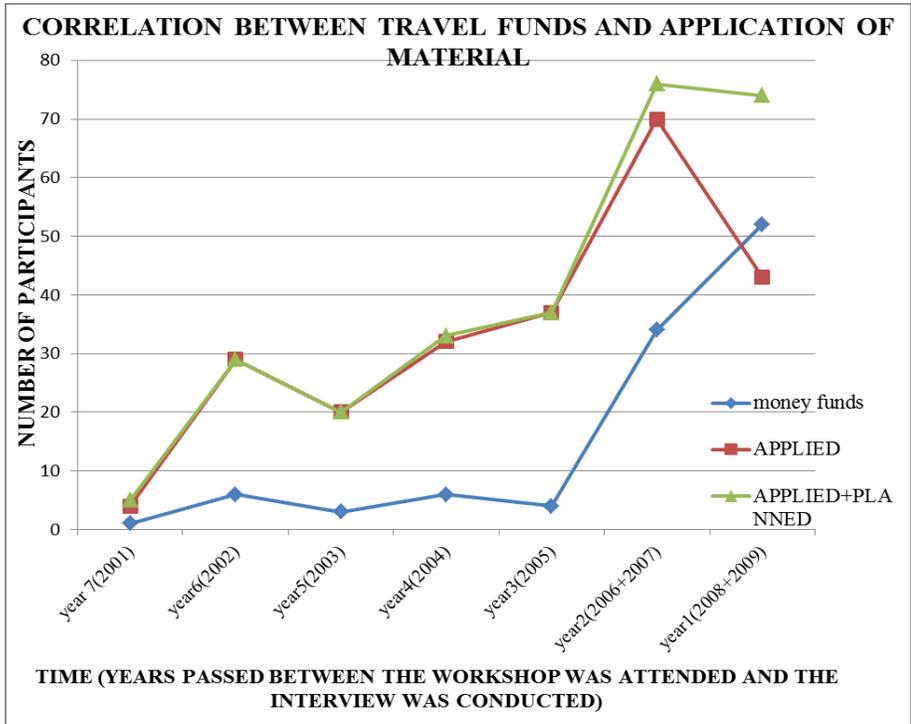
Figure 1



Some of the stimuli that can inspire faculty to apply material can be related to the goals theory which states that goals provide the main drive for humans and act both as an “energizer” and as “coping mechanism” [18] (Locke and Latham). There are many forms of goals, both personal and professional, that are important for the career growth and the professional development of faculty. Recognizing this, institutions can create an environment with incentives that would bring new innovations to the classrooms and labs benefiting both the faculty image and the prestige of the school and enhancing the graduation rate of their students. Incentives can range from financial support, in the form of grants and travel funds, to professional support provided by the department as a collaboration on publication or seminar. Some of the most obvious rewards are in the form of travel funding, demonstrating both the support of the department to attending a workshop and experience professional development, and later bringing new material back to the home institution. In recent years many institutions have realized the need for change and have provided more generous support for their faculty to attend different

professional development workshops, Figure 2 supports this trend. From the figure it can be observed that the majority of faculty in 2006-2009 has reported an increase in their institutional support in the form of travel funds. Similar to the travel funding there is an increase in the application and future plans for applying of the material.

Figure 2



One of the hidden benefits of the attending of the attending workshops is networking and collaborations. Social outings during workshops can be beneficial for the attending faculty to meet other professionals with similar interests and research.. It is expected that in RU it will take more years to apply the material obtained at workshops due to the longer working hours and the focus on research.

While a reward system of participants follows this trend, the spikes of application are happening in the years of increased financial support to the faculty. One of the hidden benefits of the attending of the attending workshops is networking and collaborations. Social outings during workshops can be beneficial for the attending faculty to meet other professionals with similar interests and research. Further analysis should focus on the

networking between faculty and how they interact after the end of the workshops. Interactions with other faculty can create an additional support group and encourage the faculty to apply material in their lectures and labs or go even further: publish and present in collaboration. From Figure 3 it can be clearly observed that 81% of the people who are planning to apply or have already applied the material are in or have been in connection with instructors or participants from the workshops.

CONCLUSION

The diverse sample presented in the testing was meant to create a feel for the diverse body of participants attending the CWCS workshops. Their expectations, goals, and backgrounds, institutions dictate not only how they interact with other professionals in their fields, but also how they will apply the material. From those factors affecting the application of the material taught at the workshops the most important the time elapsed between the attendance of the workshop and the support the instructor receives from their institutions. As seen from the discussion above the majority of faculty, close to 70%, have applied the material after six year period which shows that despite the long time gap there is still significant number of faculty applying the material. Networking has also showed to be an important factor for application of material. By further encouraging a small group learning and peer lead discussion workshop leaders can create better networking opportunities and long lasting connections that can even become future collaborations and thus serve as an additional social award for the faculty. In a small community of professionals, acceptance or simple support from peers can make a significant contribution to the learning and assimilation of the material presented at the workshops.

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