KnE Social Sciences

IC-HEDS 2019
International Conference on Humanities, Education, and Social Sciences
Volume 2020

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Conference Paper

# Effectiveness of Technology-Based Career Interventions: A Meta-Analysis Review

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## Abstract

This study was a meta-analysis of the effectiveness of technology-based career interventions. Meta-analysis was performed using Cohen's effect size in 10 experimental research results in *The Career Development Quarterly, Journal of Career Assessment, Journal of Career Development, Journal of Psychologists and Counselors in Schools* published between 1988 – 2018. Participants in the studies were children and/or adolescents ranging from kindergarten through to adults of 25 years. The calculations show the modest effect (d= 0.305). It shows that technology-based career intervention has diverse effectiveness to measure any career-related variable.

**Keywords:** meta-analysis, technology-based career intervention, career development

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Published: 11 November 2020

Publishing services provided by Knowledge E



Selection and Peer-review under the responsibility of the IC-HEDS 2019 Conference Committee.



## 1. Introduction

A major characteristic of the 21st century with significant implications on adolescent life is the growing of Information and Communication Technologies (ICTs). ICT has changed the way adolescent make career decision in their lives. Several ways to get help in career decision making. One of the ways is to seek help or advice by approaching others, such as family members or acquaintances, who often have good intentions but do not necessarily possess the relevant knowledge or expertise. Another way is to seek out trained professionals: school counselors, career counselors, or counseling psychologists [1]. Today, career intervention has already equipped with technology – we call it with technology-based career intervention. The continuous advancement of technology makes the delivery of a wide variety of online student service more possible than ever [2]. Nevertheless, each technology has strengths and weaknesses and the choice depends on the task, the availability of equipment, and also the cost [3].

Technology has generally been used to help meet client demand in one of three ways: 1) to deliver information; 2) to provide an automated interaction; or 3) to provide a channel for communication [4]. Where technology is used to deliver information, it serves a range

of functions. It can, for instance, recreate the careers library by supplying information about jobs and courses. This can increase clients' access and remove the space limitations that plagued the conventional careers library. However, this kind of technology also provides an opportunity to improve the quality of information, to harness the linked nature of the web to draw in external resources (such as employers' sites) and to provide a more media- rich experience through the use of pictures, audio and video. Example for this purposes [5] was start from The Computerized Vocational Information System (CVIS), whose implement theory by using Roe's occupational classification system [6], Career Information Delivery Systems (CIDS), led by the development of McKinlay's [7], and the most popular resource developed by U.S. Department of Labor: O*NET Resource Center (www.onetonline.org) and Career One Stop (www.careeronestop.org) that have excellent quality of job information and videos.

Where technology is used to develop an automated interaction, there are a range of opportunities. The use of technology can automate the initial exploration and diagnostic elements of the usual advice and guidance service: for example, it can facilitate psychometric, matching and reflective tools, and perform some initial diagnostic test like Fast Tomato (www.fasttomato.com), Kudos (www.kudos.cascaid.org), Lauchpad (www.reopp.org) [8]. Technology can also be used to support people to develop their career learning skills: for example, through games and simulations that can be used to provide an interactive way of exploring the worlds of learning and work like MeTycoon Games.

Finally, there is a range of tools that facilitate communication and interaction between people, usually but not always at a distance. These technologies include the telephone and email as well as a range of technologies that enable telephone and email communications to be more effectively managed. Such technologies can make professional support to individuals more accessible, and are also being used to build communities of learning like LinkedIn (www.linkedin.com).

The purpose of this study is to analyze the results of technology-based career intervention research and summarizing the results of quantitative aspect by finding the effect size value. Effect size is a quantitative index are used to summarize the results of studies in a meta-analysis. That is, the effect size reflects the magnitude of the relationship between variables in each study. A variety of studies have examined the effect of technology-based career intervention of career-related variable (e.g Career Decision Making Self Efficacy, Social Cognitive Career Development, Career Exploratory Behavior, Career Decision Profile, etc). Each study uses a different technological approach, ranging from DISCOVER, SIGI, Kudoz Galaxy Program, A Life-Design-Based Online, Career HOPES, to The Virtual Workforce Assessment Network. This is the novelty that

we offer. On that basis, our study wants to answer the question “How effective is the technology-based career intervention?”

## 2. Procedure and Methods

### 2.1. Procedure

All articles reviewed in the present study were published between 1988 and 2018 (30 years period). Articles were retained for coding and analysis if they had a focus on one or more technology-based career intervention. They (a) were experimental or quasi-experimental with treatment and comparison groups, (b) reported what could be conceived as technology-based career interventions like counseling, assessment, or classical guidance, and (c) had as participants children and/or adolescents in grades kindergarten through 25 years old.

We have chosen 10 studies, 9 sourced from popular career-related journals were *The Career Development Quarterly, Journal of Career Assessment, Journal of Career Development, Journal of Psychologists and Counselors in Schools, Computers in Human Behavior,* and the other from doctoral dissertation. Ten reports that met all of the criteria and provided the requisite data for a meta-analysis were identified and used in our analysis.

### 2.2. Methods

We use meta-analysis approach, a statistical technique that combines two or more similar research so that quantitative data can be obtained from combination of data [9]. Meta-analysis provides a metric, called an effect size. Effect size is the method used to learn effectiveness from the experiment. Effect size is a quantitative measure of the magnitude of a phenomenon. The effect size statistic (ES) was calculated by subtracting the posttest means of the comparison groups from the posttest means of the career education intervention (treatment) groups and dividing that integer by the standard deviation of the comparison group as shown in formula (1):

$$d = (\overline{X}_1 - \overline{X}_2)/S$$

which mean: d = Effect Size; $\overline{X}_1$ = Average mean score of treatment group; $\overline{X}_2$ = Average mean score of control group; S = Standard deviation. Each study only contributed one effect size in order to avoid dependency of effect sizes. Interpretation for the number of effect size calculated as shown in table 1 [10]:

TABLE 1: Cohen's criteria of effect size

| Size | Interpretation |
|---|---|
| 0.00 – 0.20 | Weak effect |
| 0.21 – 0.50 | Modest effect |
| 0.51 – 1.00 | Moderate effect |
| > 1.00 | Strong effect |

## 3. Results

Based on the results of a collection of articles discussing technology-based career interventions, we found that the use of DISCOVER was very popular from 1988 to 2005 (as shown in table 2). During that period, internet technology was not yet massive so that interventions in the form of installed computer programs were easier to implement. DISCOVER is an application developed by American College Testing, where the data processing of assessment results becomes automated so that the implementation of career guidance becomes more efficient.

After 2010, technological interventions were more varied such as the use of virtual technology and web- based applications. However, the career variables measured are relatively the same, which is about career development, self-efficacy, and career decision making.

The overall unbiased ES for the recent analysis was 0.305. According to Cohen's criteria for evaluating the magnitude of effect sizes are as follow [10], the effect size for the group of studies in the present analysis was approximately modest effect labels. In general, the largest effect size is found in Luzzo & Pierce study [18] of 0.73, while the smallest effect size is found in McLaren's study [13] of 0.03 (as shown in table 3).

This indicates that the experiments conducted by Luzo were most effective because the score of the experimental group was far greater than the score of the control group. However, the Luzo study has a fairly high standard deviation (SD) score which means the scores among respondents vary greatly. There are respondents who score high, some also score quite low. This depends on the initial score of each respondent. The intervention given in the form of DISCOVER technology certainly does not provide the same score for the respondent's career maturity. The highest SD score was in the Maples study. [15] and the lowest SD score belongs to McLaren study [13]

Table 2: Research used for meta-analysis

| Author(s) | Year | N | Mean Age | Technology-based career intervention |
|---|---|---|---|---|
| Cerrito, J. A., Trusty, J., & Behun, R. J. [11] | 2018 | 134 | 4.5th | Web based career intervention (Kudoz Galaxy Program) to measure career development scale |
| Nota, L., Santilli, S., & Soresi, S. [12] | 2016 | 200 | 13th | A Life-Design-Based Online Career Intervention for Early Adolescents |
| Molly Rae McLaren [13] | 2013 | 311 | 25th | The Virtual Workforce Assessment Network (VWAN) in enhancing Career Decision Making Self-Efficacy |
| Herman, S [14] | 2010 | 64 | 21st | Career HOPES: An Internet-delivered career development intervention |
| Maples, M. R., & Luzzo, D. A. [15] | 2005 | 34 | 19th | DISCOVER's Effectiveness in Enhancing College Students' Social Cognitive Career Development |
| Gati, I., & Saka, N. [16] | 2001 | 837 | 18th | Internet-Based Assessment: Measuring Career Decision- Making Difficulties |
| Mau, W. C. [17] | 1999 | 108 | 22.5nd | Effects of Computer-Assisted Career Decision Making on Vocational Identity and Career Exploratory Behaviors |
| Luzzo, D. A., & Pierce, G. [18] | 1996 | 38 | 13.3th | Effects of DISCOVER on the Career Maturity |
| Peterson, G. W., | 1994 | 33 | 18.8th | Comparison of DISCOVER and SIGI for measure OAQ |
| Ryan-Jones, R. E., Sampson Jr, J. P., Reardon, R. C., & Shahnasarian, M. [19] | | | | and MVS |
| Fukuyama, M. A., Probert, B. S., Neimeyer, G. J., Nevill, D. D., & Metlezer, A. E. [20] | 1988 | 77 | 19.4th | Effects of DISCOVER on Career Self-Efficacy and Decision Making |

## 4. Discussion

Some of the factors that influence the diversity of effectiveness levels are 1) the age of the respondent, 2) the forms of media and technology in career intervention, and 3) focusing on measuring career-related variables. Research by Cerrito, Trusty & Behun, [11] has a low effect size score due to the very early age of respondents so that it is not optimal in technology literacy. This is inversely proportional to research with teenage respondents who are more mature in using technology.

The form of intervention also influences the level of effectiveness of technology-based career intervention. For example, Herman [14] who used the HOPES project, namely Internet-delivered group counseling intervention as a form of intervention. Group counseling will be more effective if done face to face in person. Low scores are also

Table 3: Summary of findings

| | Experiment group | | Control group | | | |
|---|---|---|---|---|---|---|
| Author(s) | Mean posttest | SD | Mean posttest | SD | S pooled | Effect size (d) |
| Cerrito, J. A., Trusty, J., & Behun, R. J. (2018) | 26.66 | 4.115 | 26.96 | 3.69 | 3.905 | 0.07 |
| Nota, L., Santilli, S., & Soresi, S. (2016) | 20.39 | 3.07 | 18.39 | 3.43 | 3.25 | 0.61 |
| Molly Rae McLaren (2013) | 3.76 | 0.58 | 3.74 | 0.62 | 0.6 | 0.03 |
| Herman, S (2010) | 11.45 | 4.7 | 11.225 | 5.3 | 5 | 0.045 |
| Maples, M. R., & Luzzo, D. A. (2005) | 180.06 | 14.97 | 170.59 | 17.4 | 16.225 | 0.58 |
| Gati, I., & Saka, N. (2001) | 4.41 | 1.17 | 4.29 | 1.12 | 1.145 | 0.10 |
| Mau, W. C. (1999) | 14.2 | 3.625 | 12.65 | 3.65 | 3.6375 | 0.42 |
| Luzzo, D. A., & Pierce, G. (1996). | 33.68 | 4.98 | 29.58 | 6.2 | 5.59 | 0.73 |
| Peterson, G. W., Ryan-Jones, R. E., Sampson Jr, J. P., Reardon, R. C., & Shahnasarian, M. (1994) | 4.665 | 2.032 | 4.3475 | 1.71 | 1.875 | 0.16 |
| Fukuyama, M. A., Probert, B. S., Neimeyer, G. J., Nevill, D. D., & Metlezer, A. E. (1988) | 98.625 | 14.95 | 93.225 | 19.5 | 17.26 | 0.31 |

possessed by McLaren's study [13], which actually measures more than 10 variables in one study. This causes the quality of the focus of study output to be questioned.

This study contributes to the development of vocational psychology because the review analysis shows the influence of various forms of technological interventions. Another new study is limited to a variety of technological interventions in the form of installed computer programs

## 5. Conclusion

Based on a meta-analysis study that has been done, technology-based career interventions has diverse effectiveness to measure any career-related variable. This is because technology is only complementary, not replacing traditional career interventions. Technology can help us to enrich career information, facilitate assessment analysis, to network needs, but has different levels of effectiveness compared to career interventions without technology.

## Conflict of Interest

The authors have no conflict of interest to declare.

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