Research Highlights in Education and Science 2019

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SECTION 2: TEACHING and LEARNING

SECTION 1
SCIENCE, TECHNOLOGY & MATH EDUCATION

From Prof(Essional) to Prof(Essor): Best Practices for Transitioning from Environmental Journalism and Environmental Communication to Academia

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Introduction

Journalism education and communication at the college level has long reflected a mixture of priorities -- sometimes mutually satisfactory, other times conflict-ridden -- between the teaching of practical skills and the teaching, development, and research into media theory and effects. But throughout history, experienced journalists and communicators have dedicated at least some of their time away from the newsroom or communications office and into the classroom, either as adjunct instructors or as full-time faculty members, sometimes on the tenure-track and other times as professional faculty who can go by various titles. In doing so, they draw on their own experiences, the experiences of their colleagues and newsroom managers, their insights into the industry, and their network of news sources, professionals at other media organizations, and current and former employers. Professional experience gets reflected in the content of what they teach, their ability to bring in other professionals as guest speakers and presenters, and their assistance to students seeking internships and jobs.

As for the move from full-time professional to full-time professor, many do so mid-career from a variety of motives, such as a desire for change, a geographic relocation for personal or family reasons, dissatisfaction with a present employer or employment situation, the lure of a potentially higher salary and better benefits, more time for longer-form writing, or the need for more predictable work hours. Sometimes the quest for an academic job flows from an involuntary disruption of their professional career caused by outside forces, such as downsizing, merger, or closure of their news organization or from a strike. Others make the transition after retiring from a professional career, whether planned or due to an early buyout from their employers. While some return to school to earn a Ph.D. or other advanced degree as an academic credential, most do not.

Our study of such transitions comes amid major changes in the news industry, leaving many environmental journalists without media jobs or in fear of losing their jobs. At

the same time, many colleges are rethinking their approach to professionally oriented majors. The American Society of Newspaper Editors (ASNE) conducts an annual 'newsroom census' that shows a deeply disturbing trend of continuing shrinkages in editorial-side jobs. For example, ASNE reported a net drop of 3,800 jobs, or more than 10 percent, in 2014. That reflects a decline of about 40 percent from 55,000 jobs in 2006, just before the start of the Great Recession (Edmonds, 2015).

The Center for Media Research (Loechner, 2016) reported a drop in of 79,000 U.S. newspaper jobs between 1993 and 2007, followed by 168,200 fewer between 2007 and 2016. Overall, newspaper publishers eliminated more than half their jobs between January 2001 and September 2016, plunging from 412,000 to 174,000 (U.S. Bureau of Labor Statistics, 2017). The bureau reported that gains in the Internet publishing and web search portal industry -- from 67,000 jobs in January 2007 to 206,000 in September 2016 -- did not make up for the lost numbers in traditional newspaper employment. In the magazine industry, there were only 300 fewer jobs in 2007 than in 1993, but another 48,400 disappeared between 2007 and 2016.

The picture in the local television newsroom is better. A Radio Television Digital News Association/Hofstra annual survey reported local TV news jobs in the United States in 2015 reached a near all-time high, expanding by 270 positions, or 1 percent, to 27,870. 'Generally, TV newsrooms keep growing in size, but there aren't as many of them as in past years. Even so, the growth in employment overcame another small loss in the number of stations producing local news', namely three stations that discontinued producing their own news (Papper, 2016).

While specialized and niche environmental media outlets, mostly online, have sprung up, some major news organizations have reduced or eliminated their environment or science specialty beats. For example, the *New York Times* dismantled its environment desk in 2013, eliminating the environment and deputy environment editors and reassigning its staff. At the time, a managing editor at the newspaper called it 'purely a structural matter' and a reflection of reporting's shifting interdisciplinary landscape (Bagley, 2013). The next year, National Public Radio reduced the number of employees working full-time on environment and climate change from four to one, and a senior supervising editor attributed the change to a desire to cover other topics more deeply (Bagley, 2014). The president of the Society of Environmental Journalists (SEJ) wrote recently about what the landscape for environmental journalists looked like: 'Traditional newsrooms would continue to shrink. The share of SEJ members who are freelancers would continue to grow' (Magill, 2017).

Research question

This research question drives the study: To what extent do individual level (for example,

previous teaching experience, previous research experience, education, self-efficacy, etc.) and/or organizational level (for example, class size, teaching requirements, mentoring system, socialization, etc.) factors influence the successful transition from professional work into an academic position?

Prior Research

The study follows previous research examining this type of transition (see Bandow, Minsky, & Voss, 2007; Wilson, Wood, Solomonides, Dixon, & Goos (2014), particularly in fields such as education (LaRocco & Bruns, 2006) and advertising and public relations (Thomsen & Gustafson, 1997).

Faculty members in fields such as journalism and law are expected to bring real-life skills and experiences in the classroom that allows students to bridge the research-to practice- gap. Universities expect that professors in such fields engage in public policy debates and that their research contributes to the betterment of society. This expectation has given rise to the concept of the *pracademic* (McDonald & Mooney, 2011; Panda, 2014; Posner, 2009; Volpe & Chandler, 2001). *Pracademics* play many bridging roles between industry and academia that benefit the learning experience for students, such as giving 'their teaching more depth and credibility by enabling them to draw on a wide range of experience to support theoretical points' (Posner, 2009, p. 17). However, new faculty members might have limited knowledge and abilities about the culture, language, processes, and politics of academia. For instance, the balancing act of new roles such as teaching, research, and service can be challenging (LaRocco & Bruns, 2006). Wilson et al. (2014) refer to the transition as a 'culture shock'. In the context of nurse educators, Anderson (2009) described a series of metaphors related to the sea to describe such shock: sitting on the shore, splashing in the shallows, drowning, treading water, beginning strokes, and throughout the waters. Second-career academics in education have reported various degrees of ambivalence about their preparation to engage in teaching, research, and service. They also reported lack of clarity in regard to scholarly and service-related expectations (LaRocco & Bruns, 2006).

A key factor that could determine a successful transition is the process of socialization (Wilson et al., 2014). Socialization refers to the process in which an individual becomes a member of the group, organization, or community. This process depends on a range of factors, including but not limited to the size of the organization and the culture within a department. New faculty might experience anxiety and stress if this process of socialization is uneasy and if they perceive themselves as not credible enough to their colleagues and students.

Socialization can also be conceptualized as an induction process. In the context of public relations and advertising, Thomsen and Gustafson (1997) explain that induction – the

evolutionary phase during which new teachers become integrated to the profession – is an effective process, especially under the close mentoring of seasoned faculty members. In their study with 25 practitioners-turned-professors, they suggest that mentoring should be a formal process and begin during hiring. Mentors should also be practitioners-turned-professors, and the process should have regular checkups on topics such as academic life, teaching skills, the development of teaching portfolios, student advising, developing a research program, and tenure and promotion guidelines. Mentorship, formal or informal, 'can foster feelings of safety, respect, and support, key factors that may positively influence resocialization' (Barrett & Brown, 2014, p. 12). But for mentoring to be effective, Thomsen and Gustafson (1997) suggest that deans, directors, and chairs should provide incentives (e.g. course releases) to potential mentors.

The transition from industry to academia also depends on the individual characteristics of the new faculty member. Those who first transition into a Ph.D. or other terminal degree program are socialised into academia earlier (Austin, 2002). Those who transition straight from industry have been shown to follow a slightly different path. For example, their 'career capital' does not directly translate to a similar position in academia. This means that someone who might have had a managerial position in industry may have to adjust into a junior position in academia. In addition, as professionals transition, their professional skills become less and less marketable in industry (Wilson et al., 2014).

Methods

Using a survey and in-depth semi-structured interviews with eight former environmental journalists, communicators, or writers who moved to full-time teaching positions, this study presents their problems in transitions and assesses best practices for a successful academic work experience. We solicited respondents from the International Environmental Communication Association, the Society of Environmental Journalists, and relevant divisions of the Association for Education in Journalism and Mass Communication and the International Association for Media and Communication Research. Even though the interviewees represent a small sample of environmental journalism and environmental communication faculty who have made such a transition, a small number of cases can enable researchers' close association with their subjects through in-depth interviewing (Crouch & McKenzie, 2006, p. 485). As they wrote, such interviews 'target the respondents' perceptions and feelings rather than the social conditions surrounding those experiences: at least, the collection of the interview material and its interpretation and analysis are not primarily directed toward establishing "objective facts" concerning these conditions'. The authors interviewed respondents from the United States and the United Kingdom by telephone or Skype, plus one face-to-face interview. Interviews lasted about 30 to 45 minutes and were

transcribed. Interviews took place in March and April 2017. The interviews were analyzed by grouping the answers into categories based on common content.

Before their interviews, respondents completed a questionnaire about their professional and academic backgrounds and the environmental and science communication and journalism courses they have taught or are teaching. Interviewees had the choice of having their interviews recorded or not and of having their names, universities, or both kept anonymous in any publications based on the study. In this paper, all respondents' names and their institutions have been kept confidential.

Seven respondents are full-time faculty, and one is retired. Among those who teach, 83% have both graduate and undergraduate classes, while 17% have graduate classes only. Two respondents hold faculty positions but don't teach courses. Thirty-six percent of the respondents have taught at the college level for five years or fewer, 13% for 6-10 years, and half for more than 10 years. As to professional background, 14% spent 1-5 years working professionally, 14% spent 6-10 years, and 72% worked full-time for more than 11 years. One respondent was an unpaid environmental blogger and writer before taking an academic position. The oldest environmental journalism class taught by a respondent was held in 1978. Other respondents did not start teaching until 2000 or later. Two began teaching in 2012.

The study also draws on the personal experiences of two authors who made the transition from full-time professionals to full-time academics.

Findings

While professional environmental journalists or communicators owe their primary responsibility to their employer -- usually a company or public agency -- and its audience or clients, professors' primary obligation are to their students. Other dramatic differences between the two types of jobs range from the pace of duties and assignments, autonomy, and time management to performance assessments, collaboration strategies, and competition for financial and support resources such as grants. There also are many nitty-gritty things that the transitioning professional must master, including how to design a realistic syllabus -- in effect, a contract between the instructor and the students -- professional-level versus student-level expectations for quality of work, how to navigate college bureaucracy, red tape, and politics, and how to balance reaching, research, grant-seeking, and service responsibilities, as well as personal life.

Some professionals-turned-professors earn higher salaries at colleges but others take a pay cut, especially those transitioning from high-level positions at major traditional news organizations or communications firms in large urban areas. And colleges range

in size, shape, and pay, from small, private liberal arts schools in college towns or rural areas to major Research 1 public institutions with tens of thousands of students.

Environmental journalism professionals have been able to use their real-world experiences to create new venues for telling stories about science and the environment. For example, a former environmental reporter for a statewide newspaper chain launched GreatLakesEcho.org, an online news service that covers the environment in the Great Lakes region of the United States and Canada. Most of its articles and many of its visuals and podcasts result from reporting by students in environmental journalism classes or working for the environmental journalism center at Michigan State University (Freedman and Poulson 2014).

For one respondent, real-world experience was not considered a valuable asset at an R1 school. She reported that her impression from her bosses was that they expected 'serious'research, which she assumed meant topics other than those practiced by a daily journalist. As a new faculty member, another respondent said, 'I didn't consider that I could draw on my professional life that much. I need to do 'serious' research. It took me a while to see how wrong that thinking was. There's a whole field out there on alternative forms of journalism'.

A topic of interest among the respondents was how much professional experience was needed. One worry was that professionals would rule themselves out of academic jobs because they lacked 'enough' or the right 'major' market experiences. Such worry may be overstated. "'I would tell anyone who has just a few years [experience] to not underestimate the wisdom of what they've learned', said one. 'It's easy to say "well I've only done it for a few years'" – that does not matter – you still know more than your students. Even if you weren't a Pulitzer Prize- winner yourself, don't underestimate what you have to contribute'.

In a similar vein, a tenure-track professor reported that the expectations for tenure did not include journalism or creative activity related to professional communication. 'I am more concerned about meeting the traditional requirements', the respondent said. Part of the issue, said another, is that an environmental communication faculty might only be two persons, even at the largest, well-funded schools. In small departments, who evaluates such a specialist? It should be noted that this phenomenon is not unique to journalism nor communications – many fields have sub-specialties and small niches.

Many respondents found adjunct appointments to be gateways to full-time academic jobs, although several commented on the low adjunct pay despite their professional expertise. 'It certainly gives them teaching experience, which these days is critical if you want to move into an academic life', one said. Another advised, 'Being a great journalist doesn't mean you're a great teacher. Give it a try. Some people get into teaching and

hate it, so find out quick whether you hate it or not, if you really get a thrill turning the light on in somebody'.

Nearly all the respondents commented on the surprise (to them) about how time-consuming their new teaching job was. '[They are] very surprised to find out how labor-intensive it is to be a teacher', said one, referring to recently hired colleagues. Some were looking for a soft landing after a long professional career. 'We've had a couple instances where we have hired splendid professionals, and they were retiring to teaching', a respondent said. 'They were not getting involved in the professional life or the lives of their students. I found that troubling'.

Transitioning professionals can benefit greatly by consulting with others who have made a similar move, whether at their own institution or elsewhere. They can share syllabi, assignments, and sample exams. They can bounce ideas off each other and can provide insights into the politics and culture of a department or college. But respondents caution not to expect mentoring. 'Maybe they should agree with the employer to make the transition in a sensible order, like getting the training first and the practice after', one said. Another said, 'The most astonishing thing I discovered was how little university faculty are taught about teaching. Anybody in K through 12 education has got much, much more experience and skill and practice teaching than anybody at the university'.

Fitting in and deciding their own identity posed challenges for some. A former newspaper reporter and environmental advocacy group editor now at a major public university said, 'In our field, we are fortunate to have a lot of academics who come from professional backgrounds. It's not as stark a [culture] difference as, say, in economics or anthropology. But it is quite stark'.

Yet none of the respondents expressed regret at transitioning from profession to campus. One observed, 'One advantage that excited me about moving into this is that having an academic platform and an academic day job gives you a lot more freedom'. For example, he continued, 'there are a couple of things I've been able to do but couldn't if I were just freelancing'.

Discussion

There have been tensions within some journalism programs between traditional 'academics' in tenure-stream positions that often carry research expectations and 'professionals' who work with fixed-term contracts and less job security but no research obligations. A respondent described the situation at one of his past institutions where some colleagues with doctorates 'were wonderful, and some were in opposition to the notion of journalism… I was willing to take on that internecine challenge professionally. I got much more interested in science and environmental journalism than regular

curriculum development'.

Some programs have instituted parallel tenure or job security tracks for 'academics' and 'professionals'. Others, have created the 'professor of practice' or 'clinical faculty' title with greater prospects for long-term contracts. Those measures are intended to achieve several goals: give more respect to the contribution that professionals make; strengthen their job security; and assist in recruiting and retaining talented professionals.

Professional organizations offer opportunities for those who have made the transition to assist those who are considering or are in the process of doing so. For example, the 2016 annual conference of the Association for Education in Journalism and Mass Communication (AEJMC) included a workshop session called 'Making the Transition to an Adjunct or Instructor'. It included presentations on such topics as 'turning real-life experiences into exercises. Running a classroom and writing a syllabus, dos and don'ts of classroom operations, time management and work-life balance, and grading and rubrics' (AEJMC 2016, p. 29). AEJMC (Roush, 2017) also has developed a textbook with similar advice for new journalism and mass communication instructors.

Best Practices

These interviews and two of the authors' own experiences enable us to lay out a set of best practices to assist the transition for future professionals-turned-professors. Some are specific to environmental journalists and communicators, while others apply broadly to professionals from any discipline who move to academe.

Maintain and Expand Professional Skills

We believe that faculty, regardless of discipline and regardless of whether tenure-stream or fixed term, should regularly demonstrate to students that they can practice what they preach, or teach. For professionals-turned-professors, that includes producing environmental journalistic and communications works – stories, documentaries, websites, newsletters, photos, infographics, press releases, ad campaigns, and so on. That can help instructors remain connected to the industry, keep their skills up-to-date, and generate freelance income. Involving students in a project's field reporting, research, writing, and production stages advances their professional skills and provides insights into how professionals work.

Get out of the Traditional Classroom

Teaching environmental journalism and environmental communication is a strong rationale for taking students out of the classroom and into the field for practical assignments and on-site guest speakers and presentations. Places such as science laboratories, public parks, landfills, zoos, and field research sites can provide students

with story ideas, interviewing experience, and observation exercises. To educate them about environmental policymaking, take them to observe and report about state legislative, congressional, regulatory agency, or municipal council hearings and meetings, for example. One educator had his students serve as a focus group for a signs-and-symbols campaign by a local watershed group in which many of the stakeholders did not speak English as a first language.

Maintain Networks

Ex-professionals should keep up their industry connections to assist students find jobs and internships in environment-related journalism, public agency, advocacy group, and corporate communications. Those networks also serve as pipelines to find potential guest speakers while helping the instructors design and maintain their own freelance and consulting projects. Former professionals can also serve as important contacts to university alumni groups, not the least because they can talk the talk.

Understand Institutional Expectations

Hiring letters, individual and union contracts, and faculty handbooks should lay out the college's expectations for its faculty. They include teaching and research loads, service and committee requirements, minimum office hours, student privacy rights, accommodations for disabilities, tenure and promotion standards, exam policies, and make-up classes. Some are procedural, such as whether non-tenure track faculty have full voting rights at faculty meetings, while others may have a major career impact. For example, are there restrictions on a full-time instructor's freedom to undertake paid freelance assignments? Some expectations may be informal and unwritten, such as ones involving community engagement or recruitment of students to the major. Incoming professionals should discuss such matters and clarify any uncertainties or ambiguities with department chairs, program directors, and longer-serving colleagues.

Seek varied Opportunities

There are several major reasons why instructors who aren't required to do scholarly research or to seek grants may want to do so anyway, either on their own or collaborating with colleagues, often tenure-stream ones. First, their professional experience in environmental journalism or environmental communication can strengthen the credentials and broaden the expertise of the research team. Second, such projects are resume builders that can improve prospects for reappointment. Third, they demonstrate initiative, drive, and an interest in professional development. Fourth, these projects can help fixed-term faculty aspiring to a tenure-track position by building a research record. Fifth, they integrate transitioned professionals into the intellectual culture of their departments. And sixth, research can be intellectually stimulating and a change of pace from teaching.

Patience

Performance counts, but in different ways. Newsroom and communications managers demand professional-caliber work, whether from recently hired grads or veterans with decades of experience. They expect employees and freelancers to follow style and grammar rules, act ethically, meet deadlines, be aggressive and creative, beat the competition, manage time efficiently, and understand their audiences. With rare exception, those are unrealistic expectations for college students, who often frustrate instructors by missing deadlines, failing to consult stylebooks, forgetting or ignoring basic spelling and grammar rules, cutting corners, refusing to ask questions, and ignoring the mandate for intellectual integrity. One respondent said, 'What really surprised me was how ill-prepared so many of them were, that I had to teach more basics, even more basic than I had anticipated… I was surprised at how many motivated, really smart students I had… and that they were challenged to write coherent sentences'. Instructors' overarching obligation is to train -- teach -- students, including professional and analytical thinking skills, ethical practices, communication skills, and even basic life skills such as time management and professional attire. Doing so requires patience.

Patience also helps coping with the pace of decision-making at most colleges. In the private sector, media managers generally make decisions quickly, knowing that the wrong one may swiftly cost the company money and reputation and lose them their jobs. By contrast, decision-making in academe may stretch for months, even years. And heads roll more rarely for poor decisions at colleges than at media companies.

Innovate

You may inherit courses and can adapt them to reflect your own priorities and professional experience. Sometimes, however, there may not be much advance warning for an incoming instructor, as a professional communicator with a science doctorate quickly discovered: 'They plunged me in the deep end because my predecessor had left and couldn't deliver it. I just went for it and developed my own materials based on my practical experience and the little background I could put together on short notice'. You may also have the chance to design your own dream courses. When one respondent took her first academic job, she joined a program that offered no science or environmental journalism courses. 'I created the course there and it lasted well beyond my four years there'. Another has done so by bringing natural science and journalism students together. A third envisions developing a course in which students write about and maintain a website about her city's air pollution and climate-related issues that would be available to journalists and local residents 'so they can really see the impact of climate change on their lives'.

Syllabi

Syllabi provide a venue for instructors to highlight their vision for a course. Carefully prepare syllabi but remain flexible. That requires a balance between being too comprehensive, with pages of single-spaced procedures and details, and too vague. Leaving students to wonder about assignments, expectations, and grading criteria is a gateway to complaints. News professionals know that breaking developments often required abandoning well-laid plans and schedules, requiring journalists and communicators to swiftly respond. Although they are usually less dramatic, unexpected developments arise in the classroom as well, requiring instructors to change the syllabi. For example, an instructor secures a guest speaker on short notice, a blizzard closes campus for a few days, or an instructor realizes that the pace of assignments proves unrealistic for most students. Responding to any of those could lead the instructor to rethink and adjust the syllabus, including due dates.

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Embedding Formative Assessment in Inquiry-Based Learning

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Introduction

In recent years, the education system has changed drastically in all over the world. The main ideas underlying this need for change are sometimes related to how to create a more effective learning environment, and sometimes to measure and evaluate students' learning outcome. New learning approaches that have observable positive effect, and the alternative measurement and evaluation methods that are discussed take place in the educational field. Besides, inquiry-based learning and formative assessment are among the prominent topics in this field. Inquiry-based learning with formative assessment provides students with the ability to acquire new information easily, solve new problems, use creativity and critical thinking skills in designing new approaches to existing problems, rather than simply equipping them with stereotyped knowledge and skills. It is very important to be able make changes in the right way in order to train students who keep up with the current world understanding and to clarify the blind spots in the education system.

Inquiry-based learning has been part of innovative science teaching over the last decade (Grob, Holmeier & Labudde, 2017). The recent call for reform made it clear that not only did reform of science teaching, but also that assessment methods should be changed to support a new curriculum in the way that emphasizing the creation of meaningful understanding in students rather than directing them to memorize science content (Briscoe & Wells, 2001). Inquiry-based learning is incomplete when applied alone. One of the points that lacks is about the assessment method to be used in learning. In the innovative understanding of science teaching, inquiry-based learning and assessment methods that should be used in this learning created question marks for educators.

On the other side, there are research findings that formative assessment may be the most important factor in increasing academic achievement of all students, especially low-performing students (Black & Wiliam, 1998). Students need feedback to be aware of when, where and how to use the information they have learned. Moreover, formative assessment is well suited to inquiry-based learning which aims to develop students' scientific understanding through direct interaction with real situations and materials (Harlen, Brand & Brown, 2003). It is vital for the education system and the teaching to be done that how inquiry-based learning and formative assessment are applied to learning and the results obtained after the application.

Inquiry-Based Learning and Formative Assessment

"If a single word had to be chosen to describe the goals of science educators during the 30-year period that began in the late 1950s, it would have to be INQUIRY." (DeBoer, 1991). Inquiry-based learning (IBL) has a long history since Socrates. John Dewey, an American educational reformer in the first half of the twentieth century, pointed out that traditional education, which is authoritarian and rigid, and a predetermined approach to knowledge are not sufficient to understand students' real experiences (Haury, 1993). Educator Joseph Schwab (1960, 1966) was effective in taking this view into science education. In a science course with inquiry-based learning, students formulate and answer their own questions through their own discoveries. Instead of assuming that there is a single answer to the problems of different students, inquiry-based learning allows individuals to solve them in different ways by taking advantage of their strengths (Haury, 1993). Students gain a deeper understanding when they discover what they ask, discuss and learn. When students discover the principles, they learn not only by memorizing them from any textbook, but also by understanding what is happening, how it is, and what is important. In fact, students need gradual inquiry to reach their research skills, understanding and where they can conduct their own investigations from start to finish. On this basis, there are many levels of inquiry that students can advance to and they have a deeper scientific thinking as the process progresses . Looking at the literature, Schwab treated the levels of inquiry-based learning in the same way (Abrams, Southerland & Silva, 2007). Four levels (confirmation, structured, guided, and open) were identified to be useful in classifying inquiry levels (Table 1). In the Level 0, confirmatory inquiry, students are given questions and methods and the results are known in advance. This stage is useful when the teacher's aim is to strengthen an already introduced idea. Its aim is to provide students with the experience of questioning or to provide students with a specific research skill, such as data collection and recording (Banchi & Bell, 2008). In the Level 1, structured inquiry, according to Colburn (2000), teachers provide students with procedures and materials as well as a practical problem for research, but do not inform them of the expected results. In the Level 2, guided inquiry, the teacher provides only the material and problem required for the research. Students develop their own procedures to solve the problem (Colburn, 2000). Guided inquiry provides opportunities for students to take more responsibility during the lesson (Lederman, 2009). In the Level 3, guided inquiry, this approach is similar to guided inquiry as well as formulating students' own problems to investigate. Open inquiry is in many ways the same as doing science (Colburn, 2000).

Table 1. *Schwab's Inquiry Levels*

	Source of the question	Data collection methods	Interpretations of results
Level 0 (Confirmation)	Given by teacher	Given by teacher	Given by teacher
Level 1 (Structured)	Given by teacher	Given by teacher	Open to student
Level 2 (Guided)	Given by teacher	Open to student	Open to student
Level 3 (Open)	Open to student	Open to student	Open to student

"Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes." (McManus, 2008). Formative assessment is done to give feedback to the student and teacher about how well the subject has been taught and learned during teaching. The purpose of the formative assessment is to determine whether the students have reached their intended capacity and what adjustments should be made in teaching. Timely feedback to students on their conceptual learning levels and skills is a requirement of effective teaching, giving students problems to think about (Ogan-Bekiroglu, 2004). According to Yorke (2003), formative assessments may be "planned" and "unplanned". Planned formative assessments can be defined as assessments performed by referring to the assessment framework of a particular curriculum. It includes the student's necessary activities (what they need to do the work) and the evaluator's activities (evaluating the work and providing feedback for the student to learn). Unplanned formative assessments are those that occur during events but are not specifically envisaged in curriculum design. This type includes instant feedback on students' participation in a learning activity and comments on material drafts for inclusion in portfolios.

Black and Wiliam (1998) discovered that improved formative assessment, including self-assessment, was effective in improving the performance of students at the lowest level of performance. Formative assessment helps students understand the standards expected of them. When expressing expected standards, only curriculum objectives or learning expressions are often insufficient to convey the richness of that meaning.

Formative assessment can be conceptualized as consisting of five key strategies (Black & William, 2009; Clarke, 2001):

1. Clarifying and sharing learning intentions and criteria for success;
2. Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding;
3. Providing feedback that moves learners forward;

4. Activating students as instructional resources for one another; and
5. Activating students as the owners of their own learning.

Integrating Formative Assessment into Inquiry-Based Learning

Inquiry-based learning method was developed against traditional teaching methods which are based on students' memorization of the given information and whose failure is noticed (Bruner, 1961). The main specialty of this learning is to take care of the students' questions in the learning environment. In the inquiry-based learning method, students follow the same path as scientists while doing scientific research. National Research Council (NRC) (1996) identified the characteristics of the inquiry-based learning method as follows. These features;

- Be acquainted with scientific questions,
- Prioritizing the evidence that will explain or improve these questions,
- Students formulate explanations from the evidence for questions,
- Students' explanations reflect particularly scientific understanding evaluation in the light of alternative explanations,
- Students communicate and justify their explanations are suggested,
- Students plan and manage the research.

In general, when the literature is examined, inquiry includes; open, immerse, explore, identify, gather, create, share and evaluation steps. According to NRC (2000), assessment for inquiry-based learning determines whether students can produce and explain their questions at the same time, develop possible explanations, whether they can design queries and use the data as evidence to support or reject their own explanations.

On the other hand, one of the effective ways to encourage students' learning is considered to be the use of formative assessment. Formative assessment has the purpose of assisting learning, and is also called "assessment for learning" by the Black et al. (2004). This assessment includes the steps which are that where learners and their teachers are searching for and interpreting evidence, where they are in learning, and how they should proceed in the best way to learn. Formative assessments can support improvements in instructional quality and that assessments are needed to both defining the task and assessing accurately what is learned in inquiry-based learning (Barron & Darling-Hammond, 2010).

The feedback given at the end of the instructions is thought to be late interventions for

students to learn. It is believed that continuous feedback, which is the main element of formative assessment, will continue and assist students in inquiry process. The principles of inquiry-based learning and formative assessment are in harmony with each other as shown in the Figure 1.

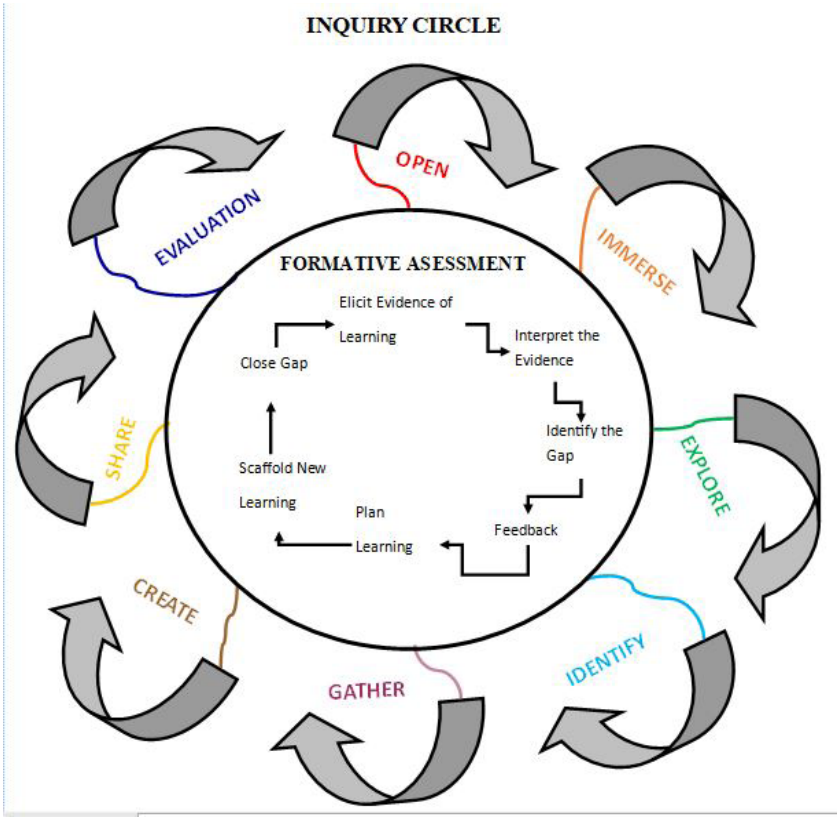

Figure 1. Relationship Between Inquiry Circle and Formative Assessment

Each color used in the diagram represents a different stage in the inquiry cycle. As is seen in the Figure 1 above, when talking about the relationship between inquiry-based instruction and formative assessment, it is seen that formative assessment can take place at every stage of inquiry-based learning. The inquiry cycle begins with the open phase; then immerse, explore, identify, gather, create, share and evaluation respectively. However, it is not possible to limit the inquiry cycle to these stages only. In some cases, the steps may be reduced and sometimes more detailed.

In an inquiry-based learning where formative assessment is not used, the assessment occurs at the end. It is not enough for students to make evaluations as the last stage. Measurement of students in the process has great importance for both themselves and their teachers to realize the stage of their learning and to make the necessary arrangements on time. For this reason, formative assessment is embedded in each stage of the inquiry. The formative assessment begins with revealing the evidence of learning and takes place in various ways, such as asking a question in some cases, letting the student comment on a relevant case, doing self-assessment or preparing research paper. If the evidence is sufficient, the next step is to proceed. If the evidence

obtained from the student is interpreted and defined as deficiency, then feedback is provided. In this case, both the student and the teacher have an idea of the current level of learning. If necessary, the teacher re-plans or changes learning. In some cases, the teacher defines new tasks to build new learning in the student. At the end of these processes, the aim is to eliminate the lack of students' knowledge.

A lesson plan template (Table 2) was prepared for learning, in which basic characteristics of the inquiry class, the components of inquiry-based learning, the stages in guided inquiry-based learning and formative assessment were taken into consideration. The original framework of lesson plan template was designed by Kuhlthau, Maniotes and Caspari (2012), and it was rearranged by the researcher by integrating formative assessments.

This lesson plan includes formative assessments in all steps (open, immerse, explore, identify, gather, create and share) that students follow. Therefore, evaluation step which is normally the last step of the inquiry circle, is not included in the lesson plan separately.

The purposes of the formative assessments (given in Table 2) in this inquiry-based learning template are;

- Open Step; to reveal whether students arouse curiosity or not
- Immerse Step; to measure whether students can make connections between subjects or not
- Explore Step; to realize how much students can get into the subject
- Identify Step; to measure whether students can form a research question or not
- Gather Step; to measure whether the students can gather the right information about the subject and how deep they can go
- Create Step; to measure students' ways of going to the results, their final results and objectives
- Gather Step; to measure how students acquire and transfer information in the process and how they compare their ideas with other ideas

Table 2. A Lesson Plan Template for Formative Assessment in Inquiry-Based Learning Method

Steps	Definition
 OPEN	Invitation to Inquiry, open minds, stimulate curiosity **F. A.:** It is revealed whether the students are curious or not with formative assessment
 IMMERSE	Build background knowledge, connect to content, discover interesting ideas **F. A.:** It is measured whether students are able to make connections between subjects with formative assessment
 EXPLORE	Explore interesting ideas, look around, dip in **F. A.:** It is measured whether students are involved in research with formative assessment
 IDENTIFY	Pause and ponder, identify inquiry question, decide direction **F. A.:** Whether the students can formulate a research question and how they follow a path is measured with formative assessment
 GATHER	Gather important information, go broad, go deep **F. A.:** It is measured whether the students can gather the correct information on the subject and how deep they are with formative assessment
 CREATE	Reflect on learning, go beyond facts to make meaning, create to communicate **F. A.:** Students' ways of reaching the result, their results and achievements are measured with formative assessment
 SHARE	Learn from each other, share learning, tell your story **F. A.:** Students' ways of acquiring and transferring information in the process, and comparing their ideas with other ideas are measured with formative assessment

*__F. A.:__ Formative Assessment

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Effect of Coding and Robotic Coding Training on Students

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Introduction

With the rapid development of technological developments, the use of robots in daily life is increasing with each passing time. In many areas, with the support of robots, people renew and develop themselves cognitively, socially and culturally. The Twenty-First Century, however, is called the age of technology.With the age of technology, many needs for education have emerged in the name of education.Thus, different structures and innovations in educational systems are required for meaningful and lasting learning. At the beginning of these innovations we heard a lot about, coding and robotics-coding, STEM, robot kit etc. such concepts come from.

Tenth development plan are examined, the main purpose of the Turkish education system democratic values, communication, self -, self-confident, Responsible, Entrepreneurial and innovative character of Science and technology prone to use, productive, and problem-solving ability enhanced perception, is referred to grow up as happy individuals.In the current age of Science and technology, coding education is seen as a very important element (Kalkınma Bakanlığı,2013).

Coding training refers to preparing software, website and mobile application through the code editor in any programming language.The research shows the use of robots in programming education as a learning-teaching strategy from easy to difficult and based on the project. (Akınıcı & Tüzün, 2016).In coding training, the robot loads the main tasks into the robot and the results are seen on the working system.

As a result of a research, it was found that robotic coding and computer coding skills with Python programming language can be taught more quickly and easily.It is also seen that with this programming editor they increase student motivation and gain experience in coding.They appear to have taken advantage of all the advantages of visual programming with fewer problems, with less effort than their previous approach(Resinovič, 2015).

An hour of Code event is held every year in more than 180 countries in the field of information technology, reaching millions of students and talking about the importance of coding education.In many countries, computer programming and robotics coding courses are taught as a compulsory course in schools. In our age, robotics is increasingly important to coding and is passed on as central lessons and basic skills that students need to learn in schools(Passey, 2017).

In Turkey, for the 2019-2020 academic year, the Ministry of Education has introduced

a new curriculum for high schools.The program includes algorithm programming in eleventh grade, biotechnology in twelfth grade, energy systems of the future, materials science, artificial intelligence applications, Internet of Things applications, etc. they must be studying.In addition, the Ministry of Education organized a workshop on production training with Informatics in June 2019.It has been determined that the Information Technology course will be the central course in 5 years.81 il 150 pilot primary and secondary schools, coding and 3D design activities will be carried out in order to gain production skills with Informatics (MEB, 2019).

In the work of Çankaya and others(2017), 9 students were given robotic coding training at a secondary school in Balıkesir province. At the end of the training his views were taken. Coding training using qualitative and quantitative methods has yielded positive results. Students achieved a high achievement average of. The students will be more successful in coding education with high creative problem solving skills.

A study has been conducted on the robotic coding model in the teaching of programming languages. In the study it is thought that arduino and similar platforms will offer an important solution in embodying abstract concepts, helping to physically observe the code (Ersoy, Gülbahar, & Madran, 2011).

Sayın and Seferoğlu(2016) in their study, drawing attention to coding education, they stated that in the future, coding-oriented courses will have more place in the curricula around the world. of turkey is among the world states in order to keep up with the development of coding training, coding for the issues stated in the curriculum should be given more space .

Göksoy and Yılmaz(2018) in their study,10 information technology teachers and 15 students who took robotic coding courses were interviewed about the course. According to the results of the research, it was revealed that robotic coding courses provide students with problem solving, creative thinking, numerical thinking, productive working, designing, systematic and analytical thinking and increasing and influencing their academic success.

Research has been carried out on the update of the curriculum of Information Technology and software course. 350 teachers were interviewed in the study. As a result of the interview, the rates in Table 1 are revealed. Primary education according to Table 1. the stated gains for the tier will be applied based on the activities.By establishing a bridge with the high school curriculum, the result is to ensure continuity in the teaching of Informatics subjects. (Gülbahar & Kalelioğlu, 2018).

Table1. Views on the Curriculum

Themes	Percent
Information technologies and software courses must be compulsory at all levels.	%27,7
Coding training should be available.	%15,2
Lesson hours should be increased.	%7,5

In the research conducted by Ince(2018), 16 associate degree students in the Computer Technology Department of the Vocational School of Technical Sciences at Süleyman Demirel University have put out projects on robotic coding. These events are 5. The project was exhibited in the exhibition and 16 students were interviewed. The result was that they were interested in robotic coding and their willingness to do projects made them aware of their willingness to do so and increased their professional self-confidence.

Research by Kasalak(2017) covered the applications of robotic coding shown at the secondary school level. It is aimed to determine whether there is a meaningful relationship between students ' interest and desire in block-based coding. Furthermore, the lives of 58 students in public school related to robotic coding practices were investigated. The results emerged that the students found the applications fun and engaging, that they were willing to participate in the applications, that the applications contributed positively to their personal development.

In one study, MBOT robot Kit easily embodied the effects of abstract concepts with the use of robots in coding training. It has also been seen that students can develop creative thinking and problem-solving skills more easily and quickly (Numanoğlu & Keser, 2017).

Teaching coding to K12-level students improves computing thinking skills and is expected to increase university-level learning outcomes.(Mayer ve others,2013).

Patterson (2011) states that in 14 of the 19 research papers with his work, robot use in coding education has and will have a positive impact on students in the future.

In the research conducted by yüksekturk and Altiok(2015), the opinions of 25 teacher candidates in the third and fourth grade of Information Technologies regarding computer programming teaching were taken. They have been provided with an effective and accurate experience of new attitudes and tools that they can use in coding teaching. Positive statements have emerged about its post-event gains. Suggestions have also been made about similar activities.

As a result of research by Yadagiri, Krishnamoorthy and Kapila (2015), in recent years

robotics-coding has attracted great interest in various trainings. First, the use of robotics for formal and informal learning was studied. Second, students of both sexes are known to react positively to robotics. Third, there are numerous publications on this topic. The use of robotics for all grade levels, including Elementary, has been evaluated. These are elementary, middle school, high school, Bachelor's and master's degrees. Fourth, robotic coding can be used to support student learning, including a range of disciplines. For example, robotics competitions can be held to enrich graduate education.

In the research conducted by tümer and others(2018), 120 students at Konya Ereğli Science High School were given robotic coding training. After the training, 4006 TUBITAK projects were prepared and an exhibition was held. Discussions were held to determine the impact of TUBITAK 4006 projects on students. They found robotics coding fun, adopting group work. Also robotic coding students to increase their interest in class, problem-solving skills, improve creative thinking and innovation skills developed in the robotic and sensor by using arduino coding by increasing the skills to do students professional self-confidence has emerged.

Of the platforms built on coding, 40 were studied according to their different aspects. These editors were analyzed by comparison, and as a result, Scratch, code.org and app2inventor coding software has been shown to be more advanced with features and functions than other software. It has been seen that this software can be more useful to children's coding learning.(Baz,2018).

In this study, domestic and foreign academic studies related to the use of robots in coding education were searched. The articles reviewed aimed to reveal the benefits, necessities and harms of robotic coding as effects on students.

Conclusion

Students now and in the future, assessment in education, problem solving and a critical perspective developing, synthesizing, analyzing, design-oriented thinking, creative thinking and collaborative working skills is of great importance for you to earn. One of the ways to gain these skills to students is through teaching robotic coding training. Because coding education not only imparts information technology skills, but also helps students develop and accelerate problem solving, creative thinking, production and reasoning skills. (Akpınar ve Altun, 2014).

Students develop themselves in the subjects and applications they encounter at school through the teaching of robotic coding and enable them to achieve success in their future lives. Coding software designed for pre-school children is separated from complex code structures, allowing them to make fun applications that they can easily learn. These coding software have been prepared in accordance with both age groups

and developmental levels of children. Rather than teaching coding directly, the software aims to increase the motivations and interests of children who use and learn coding tools. Coding software is now ready for students to use from pre-school to university education(Baz, 2018).

Coding software and applications under development are currently based on certain age groups and levels, but teachers and parents have to teach the right software and coding for children.In addition, the main development areas of children are language, social, mental, novelistic, etc. they need to complete themselves in matters. It is important that these considerations are fulfilled by age and adapted to their peers. Before these important issues are fully fulfilled, it is seen that starting coding education will lead to children not being able to complete their development in many ways in the future. Buddha causes children to have a negative impact on their future.

There are also differences in coding software, mobile adaptation options, fees, language support and assistance support. These options make it compulsory to choose coding software by considering the age and readiness of the child.

As a result of the research, there are many positive effects on students about the use of robot in coding education in the scanned articles.These are;

- ✓ Learn programming easier and faster,
- ✓ They found it fun and embraced group work,
- ✓ Also, robotic coding increases students ' interest in class and school,
- ✓ Develop problem solving skills,
- ✓ Develop creative and innovation thinking abilities,
- ✓ Increased in-course motivations,
- ✓ Robotics using Arduino and sensor-enhances coding skills,
- ✓ It has been determined that it gives students professional self-confidence.
- ✓ Increased achievements in different courses,
- ✓ The working process in coding education allows students to look at the lessons from a different dimension.
- ✓ Children now experience his pleasure by producing something, and children who experience the dignity of this situation now feel different and privileged among their peers, etc. the consequences are emerging.

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STEAM Education for Students with Specific Learning Disorders

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In recent years researchers and educators have paid more attention to the importance of integrated fields of science, technology, engineering, arts, and mathematics (STEAM) as powerful approach in teaching all students, including those with learning disorders (Ge, Ifenthaler & Spector, 2015; Hwang & Taylor, 2016). Elements of STEAM have been applied to nearly every group of age, including to kindergarten (Aronin & Floyd, 2013), elementary stage (Han, Park, Jo, Park & Kim, 2011), high school (Jho, Hong & Song, 2016), and at the higher education level (Ge, Ifenthaler & Spector, 2015). Further, STEAM has been utilized with students with disabilities (Hwang & Taylor, 2016). In this chapter, an emphasis will be placed on the importance of applying STEAM education for students with learning disorders (LD). These students have been recently included in the general classrooms with their peers who come from the community. Students with disabilities have the right for a full access to the general education system. Yet, the question to be asked, is the educational system ready to welcome them and provide them with the best education that most match their needs?

Background on STEM Education

The term STEM was proposed back in the early 1990s by the National Science Foundation (NSF) and has been used as a generic term spanning across various fields including education, business, policy, programs, or practices that involve one or several of the STEM disciplines (Kuenzi, 2008; Morrison & Raymond, 2009; Johnson, 2012). Bybee (2010) argues that the education community has embraced a slogan without really clarifying what the term might really mean when applied beyond a general label. Generally, they refer to STEM education as teaching science or math. Despite numerous attempts to define STEM in educational perspectives, yet the term has not been globally defined. Some researchers, according to Hwang and Taylor (2016), have referred to STEM education as a broad education category involving math, science, engineering, or technology education; thus, teaching any one of the four disciplines can simply be referred to as STEM education (Hwang & Taylor, 2016). Sanders (2009) expands the definition and proposed that “STEM education includes approaches that explore teaching and learning among any two or more of the STEM subject areas, and/or between a STEM subject and one or more other school subjects” (p. 21).

The USA Department of Education (2007) provides a more inclusive definition of STEM education, “Science, Technology, Engineering, and Mathematics education programs are defined as those primarily intended to provide support for, or to strengthen, science, technology, engineering, or mathematics (STEM) education at the elementary

and secondary through postgraduate levels, including adult education" (p. 11). Brown (2012), however, proposed that STEM education is not about blending STEM disciplines one with another as a set of construct, but rather to collaboratively move towards using STEM as continued learning. Teaching and learning STEM disciplines viewed as valuable in improving the quality of daily life for all students, especially for students with disabilities. STEM education provides more and faster work-related opportunities in the upcoming years (Basham & Marino, 2010).

The Emerging of STEAM Education and its Benefits

From a sociocultural perspective, Moss (2003) asserts that:

> "Learning is perceived through changing relationships among the learner, the other human participants, and the tools (material and symbolic) available in a given context. Thus learning involves not only acquiring new knowledge and skill, but taking on a new identity and social position within a particular discourse or community of practice. As Wenger puts it, learning "changes who we are by changing our ability to participate, to belong, and to experience our life and the world as meaningful."(p.14).

From this understanding STEAM education, driven by learner-centered instruction, provides a powerful learning opportunities for students with learning disabilities. The principles guiding this approach depend on active learning, hands-on engagement to solve real world problems and opportunities for purposeful movement abound (Park, Byun & Sim, 2016; Kim & Park, 2012; Radziwill, Benton & Moellers, 2015). Further, STEAM allows for shorter class times in a unique way. Actually, STEM class time is not shorter; however, there are built-in stopping and starting points as students move through the engineering design process. This provides breaks and time for students to process what they are learning. In smaller classes, teams of four to six students are the norm for well-designed STEAM classes. While the class may contain a normal number of students, students work primarily in small group settings.

In STEAM learning setting, students learn in respectful, understanding environments. STEAM classes generally are safe spaces. If a team fails to create a workable solution for a problem, it is not a problem. It's just a normal step in improving the design and succeeding. Ideally, team members show respect and accept one another, and teachers monitor teams as they work to see that this is happening. Finally, STEAM allows for flexible teaching styles as the ultimate exercise in teaching is flexibility (Park, Byun & Sim, 2016). Land (2013) argues that progress in industrial economy does not come from technology alone, but rather from the melding of technology and creative thinking through art and design. The "A" in the STEM feed creativity and innovation. As long as an individual challenges his or her boundaries by developing conceptual

innovation, a person may be able to achieve their best innovative potential in any field.

Research reveals that jobs in the STEM fields are increasing three times faster than positions in the rest of the economy (McDougall, 2012). This huge gap between the sub-areas of the industrialized jobs in the USA economy has drawn the attention to the importance of investing resources in teaching STEM domains areas (Land, 2013). With a quick-tempered youth focused on self-indulgence and leisure, Land (2013) argues that the society must make STEM education more appealing. Adding the arts into the STEM equation can revive the platform, providing not only an interesting approach, but also opportunities for the self-expression and personal connection new generations aspiration. Proponents of the movement of integrated of the arts into STEM education claim that an integrated STEM and arts is vital to foster innovation and creativity in the STEM disciplines. In essence, integration of arts has the potential of engage the mind in multimodality, thus leading to the integration of motor, perceptual, and cognitive skills.

Anderson-Inman (2009) makes the case for the importance of STEAM education drawing on the 21st century skills. Citizens of the 21st century are required to know how to work collaboratively within a collected intelligence, participate in social networks, negotiate across cultural differences, and navigate contradictory data available to them. According to Sutherlin (in Land, 2013) 21st century skills extend beyond literacies and may include play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgment, transmedia navigation, networking, negotiation, and visualization.

In South Korea, for an example, whose students have achieved one of the top five scores among the 64 countries participated in the survey in 2012, in the Program for International Student Assessment (PISA) and the Trends in International Mathematics and Science Survey (TIMSS), the reports indicate that the Korean students, despite their excellence achievement in the mathematics, science and technology, indicate in 2006 that they have low levels of interest in and enjoyment of learning science and mathematics. Based on this, the Korean Ministry of Education in 2011, proposed a policy on the reconstruction of Science, Technology, Engineering, and Math (STEM) education via enhancing interdisciplinary learning and adding “Arts” to STEM, which led to what is known as Science, Technology, Engineering, Arts, and Math (STEAM) (Park, Byun & Sim, 2016). This Korean experience, shows the emergence and importance of the “Arts” integration in STEM for the purpose of making the learning for elementary and secondary students learning experience as meaningful and engaging as possible.

Students with Learning Disorders Included in the General Education System

Not so long ago, students with disabilities, including learning disorders, were taught in self-contained special education classrooms within their own school or even in

segregated schools for disabilities (Mader, 2017). But since the early 1990s students with learning disorders have been gradually included in the general education system. Research shows as many as 85 percent of students with disabilities can master general-education content if they receive educational supports. Supports can include access to a special-education teacher, having test questions read aloud, or being allowed to sit in a certain part of the classroom. When students with disabilities are included in classrooms with their peers, researchers assert that the high expectations and instructional strategies "lend themselves to those students being more successful than they would be had they been in a separate, self-contained environment (Mader, 2017).

Researchers (i.e., Lindsay, 2007; Skrtic, Sailor & Gee, 1996) argue that general education classes allow students with disabilities to be educated in the mainstream, which is a more inclusive setting. Generally, inclusion was created to advance the learning opportunities for students with disabilities. The students received their education from general education teachers that received their training in the particular subject. Students in the mainstream also have the opportunity to interact with students that do not have disabilities. Inclusion allows students with disabilities to become members of their school community and begin to feel valued as a student (Causton-Theoharis & Theoharis, 2008).

Causton-Theoharis and Theoharis (2008) argue that inclusion is built on the premise that all students should be valued for their unique abilities and included as essential members of a school community. Inclusion is not a place; it is a way of thinking. Therefore, moving students with disabilities from special education setting to the general education is just the first step towards full inclusion. The next step according to Causton-Theoharis and Theoharis (2008) is to make them feel they belong.

Characteristics and Needs of Students with Learning Disorders: Students with specific learning disorders (SLD), also referred to as specific learning disabilities under IDEIA, a Specific Learning Disability (SLD) is defined as: A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Specific learning disability does not include learning problems that are primarily the result of visual, hearing, or motor disabilities, or mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage. (US Department of Education, 2006, pg. 46757).

Since the reissuing of the Diagnostic Manual of Mental Disorders (DSM-5) in 2013, a new definition of SLD has emerged. DSM-5 identified the following diagnostic criteria

A. Difficulties learning and using academic skills, as indicated by the presence of at least one of the following symptoms that have persisted for at least 6 months, despite the provision of interventions that target those difficulties: 1. Inaccurate or slow and effortful word reading (e.g., reads single words aloud incorrectly or slowly and hesitantly, frequently guesses words, has difficulty sounding out words). 2. Difficulty understanding the meaning of what is read (e.g., may read text accurately but not understand the sequence, relationships, inferences, or deeper meanings of what is read). 3. Difficulties with spelling (e.g., may add, omit, or substitute vowels or consonants). 4. Difficulties with written expression (e.g., makes multiple grammatical or punctuation errors within sentences; employs poor paragraph organization; written expression of ideas lacks clarity). 5. Difficulties mastering number sense, number facts, or calculation (e.g., has poor understanding of numbers, their magnitude, and relationships; counts on fingers to add single-digit numbers instead of recalling the math fact as peers do; gets lost in the midst of arithmetic computation and may switch procedures). 6. Difficulties with mathematical reasoning (e.g., has severe difficulty applying mathematical concepts, facts, or procedures to solve quantitative problems). (Eissa, 2018).

According to Learning disabilities Association (2019), some of the most common features of SLD include difficulty following directions, inability to discriminate between/among letters, numerals, or sounds, poor reading and/or writing ability, eye-hand coordination problems; poorly coordinated, difficulties with sequencing, and/or disorganization and other sensory difficulties. Additional characteristics in a day to day life may include: responding inappropriately in many instances, distractible, restless, difficult to discipline, difficulty adjusting to new changes, difficulty listening and remembering, difficulty telling time and knowing right from left, difficulty sounding out words… etc. Such difficulties cannot be attributed to lack of intelligence, or environmental issues or sensory related deficits (Learning disabilities Association, 2019).

Generally, individuals identified with SLD in schools also may have a Reading Disorder, Mathematics Disorder, Disorder of Written Expression, or Learning Disorder Not Otherwise Specified. Students with SLD are at high risk for school dropout compared to their general education peers (Morrison & Cosden, 1997). Additionally, research contends students with SLD who have graduated from secondary school have lower rates of attending postsecondary education.

In terms of behavioral issues, students with SLD are at higher rates of conducting behavioral problems compared to their peers without disabilities (Zach, Yazdi-Ugav & Zeev, 2016). Zack, et al. (2016) indicate that about 75% of learning-disorders children manifest deficits in the social skill area that differentiate them from their non-learning disorders peers. Further, they add that limited social ability may often affect social interactions, and therefore cause a feeling of rejection, isolation, and loneliness among

students with SLD. Some common behaviors include, attentions deficits disorders, impulsivity, hyperactivity, conduct problems, and withdrawn behavior. Socially, most individuals with SLD exhibit greater level of social incompetence. Common social deficits include, less interaction with peers, peer rejection, and lower social status (Kavale & Mostert, 2004). Common learning and cognitive characteristics of students with SLD include, short attention span, poor memory skills, temporal processing deficits, processing speed (Démonet, Taylor & Chaix, 2004; Moll, Göbel, Gooch, Landerl & Snowling, 2016).

Generally, students with SLD need to be taught in the general inclusive system, and they need a more blended instructional approaches that take into consideration their educational, emotional, and social needs without compromising on the quality of education they receive. Further, students with SLD need a more specific support including:

- differentiated instruction that increases their engagement,
- academic support that help them access the full curriculum,
- behavioral support to help them maintain a positive learning environment with their peers with no disabilities,
- and continuous use of school resources including technology, hands-on experiments and all other available resources.

Teaching Students with Learning Disorders Using STEAM

Although there is a scarce research on STEAM education for students with disabilities, researchers have started to pay greater attention on how to meet students' special needs into the design of instructional plans. The journal of "Teaching Exceptional Children" for example, has recently launched a special issue on the integration of STEM education for the purpose of supporting students with disabilities in K-12 grades (Hwang & Taylor, 2016). Bashsm and Marino (2013) suggested that the origin of the STEM education lies in the understanding of the role of engineering, and they proposed that the universal design for learning framework would be a valuable asset STEM education. Researchers argue that STEM education should be expanded to embrace and integrate with the disciplines of the arts in order to facilitate and promote accessibility of STEM learning. The arts areas may include (i.e. dance, music, and theatre, visual arts and media arts. (National Coalition for Core Arts Standards, 2014).

Hwang and Taylor (2016) contend that STEM + 'A' (STEAM) should benefit students with disabilities in different ways: the nature of arts, as oppose to other disciples where a student is required to achieve a certain level at a certain time, arts is liberal and focuses

on creativity rather than a standard achievement. Therefore, introducing the arts in the STEM education lowering the threshold and make way for various ways to approach learning. For an example, Hwang and Taylor (2016), suggested that the teacher can connect science instruction to the concept maps and graphic organizers as a visual support can be considered as visual arts. In this case, the researchers indicated that "students allowed to create their own visual representations of science concepts allows students to be visually creative and provides teachers an opportunity to determine what students may or may not have learned." (Hwang & Taylor, 2016, p. 43). (see Figure 1 for examples of graphic organizers: **concept map**: the civil war in America, and **cycle**: the life of a sea turtle).

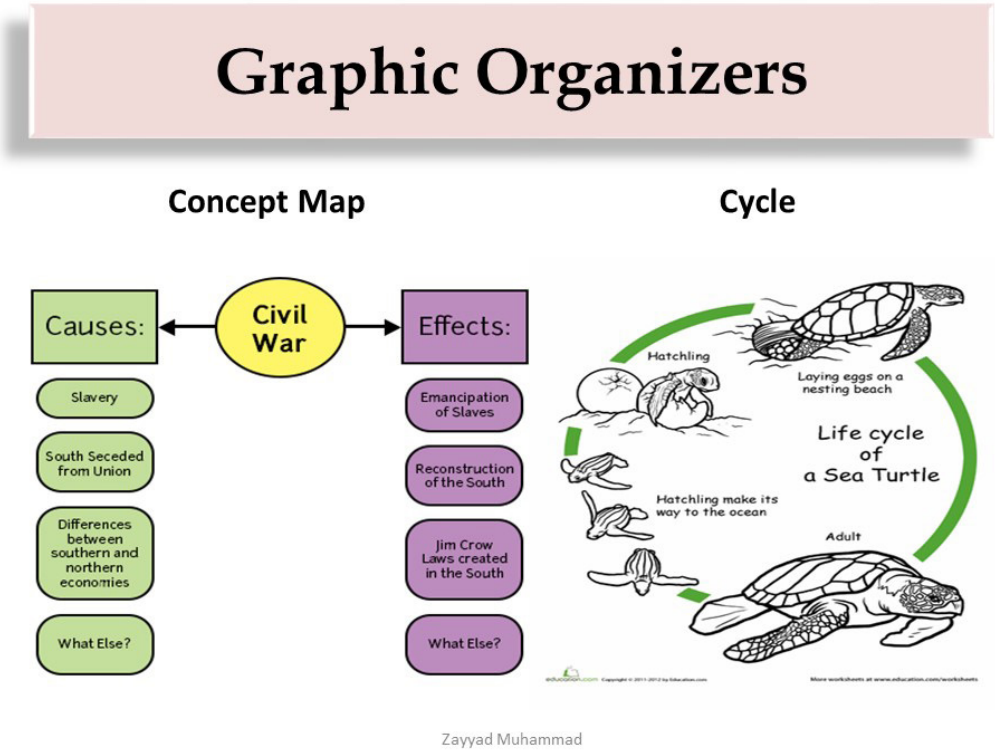

Figure 1. Four Examples of Graphic Organizers as Visual Supports.

Universal Design for Learning (UDL) and STEAM Education

The Universal Design for Learning (UDL) has been proposed by a group of researchers in the mid of the 80s of the twentieth century at the Center for Applied Special Technology with the goal of using technology to enhance learning for students with disabilities at various school ages (CAST, 2011). UDL model soon become a vital instrument for educators at the academy as it integrates multiple disciplines. UDL provides a learning framework to actual change the learning environment for students with disabilities (Fovet, Mole, Jarrett & Syncox, 2014). UDL relies on the three learning principles: a) using multiple means of representation, b) expression and action, and c) and engagement. Representation is the actual delivery of materials performed by the educators. Some

students, may need a visual representation to better perceive the information, while others may rely heavily of audio display. Multiple ways of expression refer to the students' ability to respond to the learning conditions. Some students with disabilities, may need to use computers or touch screens to respond to the learning, while others may need to orally record their responses. Engagement provides opportunities for students to stay motivated and involved in the learning tasks (Basham & Marino, 2013).

The premise of the UDL model relies on the assumption that the brain of human being has three incredible networks that guide their learning. The first network is the "recognition" network. It answers the question "what" of learning. Data and information transferred through the senses to the back of the brain, including the occipital and temporal lobes "recognition network", processed for meaning in the center of the brain "the affective network", and ultimately organized in the frontal lobe for meaningful action "the strategic network". This broad understanding of the role of the brain in organizing the learning experience of humans, maybe helpful for educators to better arrange and predict the learning experience of all children.

UDL recognize the variability of learning in the following three domains as illustrated by CAST (2018):

- Engagement: this network concerns with the "Why" question, where students show their interests, task investment and effort, self-regulation and persistence in task completion. The engagement network optimizing the interest of the learners. It optimize individual choices, relevance, values, and authenticity. Further, it minimize threat and distractions.

- Representation: this relates to the "What" question, which aligns with the recognition network which include perception, memory, language and comprehension. This network provides multiple ways of customizing the display of information, offers alternative ways for auditory and visual information.

- Action and Expression: this is the "How" question which aligns with the strategic network. It represents physical action, expression and communication, and all executive functions of the brain. It provides options for physical action, and vary the methods for response and navigation, and optimize access to tools and assistive technology.

The figure below explains the UDL guidelines as elaborated by CAST.

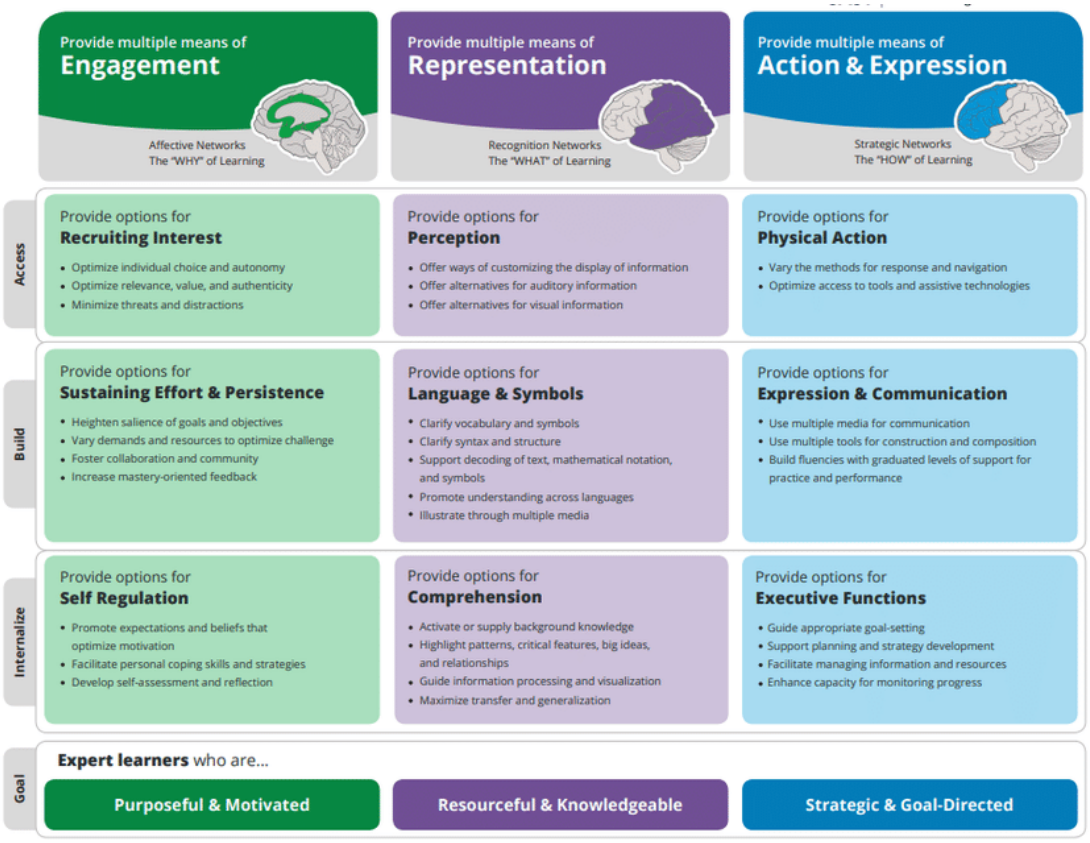

Figure 2. An Image of the UDL Guidelines Based on Brain Networks.

UDL aligns with the STEAM education. UDL stipulates that curriculum, instruction, and related materials should provide multiple representations of key concepts, principles, and vocabulary. Curry, Cohen and Lightbody (2006) explain that in a technology-enhanced STEM context, this can be accomplished by presenting information using graphics, simulations, video, and sound. From the UDL guideline, a curriculum encompasses everything that a learner encounters within a learning experience including curricular standards and goals, instructional materials and tools, and instruction, as well as the means by which outcomes are assessed. UDL applies instructional practices and modern teaching approaches, such as technology and assistive technology. Keeping in mind the three learning networks (affective, cognitive, and strategic) UDL falls within the principles of STEAM education, especially the blending of several disciplines with the arts which resonate well with the needs of students with SLD. With a specific focus on making all learners "expert learners." Basham and Marino (2013) suggests that four critical elements be present within an instructional environment for it to be considered UDL-based: clear goals, intentional planning for learner variability, flexible methods and materials, and timely progress monitoring.

Final Thoughts

Students in the technology era of the 21st century in a big need for a well-designed curriculum that is meaningful, learner centered, flexible, matching the rapid growth of

technological revolution. Such curriculum that does not exclude any group of students, especially students with SLD who comprise at least ten per cent of the students' population at any grade level. The UDL approach along with the opportunities that can be offered by STEAM education in a rich learning environment would definitely account for a positive change for the future of all learners.

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A Collaborative Model for Training Teachers to Use Graphing Calculators

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Introduction

It is a well-known criticality of contemporary educational systems the fact of not being able to keep up with the dramatic changes occurring in our highly technologized society, in particular in digital technologies. (Collins & Halverson, 2009)

In Italy this criticality was particularly severe because of years of chronic underfunding for the renewal of school instrumentation. The result is that Italian teachers are not used to take advantage of digital technologies in their teaching and appear even more distant from the contemporary world than many of their European colleagues.

In recent years, in order to reduce this gap, a lot of efforts and much money have been put in the realization of the "National Digital School Plan" (PNSD) both for acquiring new instrumentation and providing teachers with suitable training for bridging the digital skills gap that had been accumulated over the years. (Avvisati & al., 2013). Therefore, many laboratory activity courses have been set up to update individual knowledge on technology issues in different areas. This means that thousands of teachers participated to these activities on IT skills organized by the Ministry of Education. In addition, many institutions and private companies offer professional training aimed at developing skills in digital technologies. We believe that the effectiveness of these courses is unsatisfactory.

In our experiences both as trainees and as trainers we got confirmation of the idea that a different model of training is necessary. It usually happens that teachers attend trainings that deal with topics completely unrelated to what they are teaching in their classrooms. For teachers unfamiliar with the contents of the training courses, this means that too much information is usually packed in too short time. Moreover, these courses are not connected with classroom activities. Therefore, the time elapsed between training and experimenting in class is too long and trainees usually forget everything they learned before making use of it in their classes.

In Service Teacher Training for Digital Technologies in Italy

In service teacher training has a short and weak tradition in Italy. Even if the situation

is decisively improving, the legacy of the past is reflected in a conservative attitude towards teaching. This manifests itself in a widespread inertia toward changes. To overcome this inertia it is necessary to involve teachers to play a more active role.

Resistance to changes becomes particularly evident in the implementation of teaching practices with new technologies.

The Italian Ministry of Education is implementing a series of interventions to promote the use of educational technologies. Among these, the choice to allow the use of graphing calculators in the State exam is particularly relevant. As we have already said, it is difficult to train Italian teachers at using new technologies. Convincing them to use graphing calculators is, if possible, even more difficult. There are many preconceptions and alibi such as: they are not very intuitive; they causes arithmetic and graphic illiteracy; computers are more powerful; they are obsolete; I have already got a good scientific calculator hence I don't need a graphing one...

On the other hand, many students show a strong interest to experiment with graphing calculators because their use is now permitted in State exam and because they appear very user friendly when they begin to use them. Therefore, there is a lot of demand for training courses. Very often however these courses leave teachers dissatisfied for many reasons which we will briefly sketch in the next section.

The stimulus to develop a more effective training model is therefore particularly urgent for graphing calculators and we concentrate upon this particular technology. However, the same model can have, in our opinion, the same positive effects also for training in all other digital technologies.

Training Teachers to Use Graphing Calculators

We started from analyzing the various teachers' attitudes towards graphing calculators in order to devise a more effective training model. We have classified these attitudes in 5 categories.

Teachers Refractory to Digital Technologies (type A)

They are old-fashioned teachers, which are very tied to frontal teaching and are not favorable to introduce digital technologies in teaching. It is not a problem linked to a particular type of instrument but a negative approach to technological tools in teaching.

Teachers Favorable to Use Technology but Against Graphing Calculators because "They Make Students Lazy" (type B)

They are favorable to the use of technology, they use digital presentation and educational

software, online resources and frequently interface with the computer world but oppose to the introduction of graphing calculators in teaching. Their most typical objection is that «nowadays no one is able to perform elementary arithmetic calculations by mind anymore because of the widespread use of scientific calculators. If we allow graphing calculators, no one will be able to study the graph of a function, to compute the value of a derivative, the value of a statistical index anymore». They believe that calculators are subsidies that allow students to do without studying. They fear that calculators could cancel the need of studying and the fatigue of computing by providing immediate answers. Moreover, they object that the faith in graphing calculators makes students believe that they are exempted from providing justifications.

Teachers Favorable to Use Technology but Opposed to Graphing Calculators because "They are Ineffective" (type C)

They consider graphing calculators as simple games that do not add any useful competence. They believe that graphing calculators may be helpful only for solving exercises of mere computational content but they are useless in solving problems that require any form of reasoning. Their views on the potentiality of graphing calculators is severely biased and they do not believe that many intriguing activities can be arranged with this instrument. Their underestimation of the educational value of calculators let them consider that the required investment of time and energies is disproportionate compared to the results.

Teachers Afraid of Using Digital Technologies, in Particular Graphing Calculators (type D)

They are simply afraid of their lack of knowledge of the instrument. Sometimes they are frightened because they doubt or are worried about not having an adequate preparation and therefore they are fearful of not being up to answer to students' questions. Therefore they do not intend to show their lack of competence and they prefer not to get involved for fear of losing their professional respectability. Often their refusal to use a new tool derives from the lack of knowledge and from the little time available to learn its functioning.

Teachers Favorable to Use Technology and Eager to Learn to Use Graphing Calculators (type E)

They are the more technological ones. They frequently introduce new tools in their teaching and have a positive attitude towards technological innovations. They are curious about the possibilities offered by new technologies and are not afraid to try them. So, they are usually quite willing to tinker with graphing calculators.

The Graphing Calculator is a Useful Tool for Teachers

Regardless of teachers' attitudes towards calculators and computers, wide availability of powerful numerical processing tools dramatically changed the priorities in mathematics curriculum. Graphing calculators may be precious allies in shifting the focus of teaching/learning from "computing" to "controlling computations". Thanks to computers rapidity of calculation, one can quickly analyze data variation with respect to parameters. Therefore, computers favor, through heuristic investigation, the development of intuition behind data modelling and free data modelling from the heavy computation burdens that previously hindered their development.

Calculators and computers, as is well known, may offer effective ways to experiment and discover many aspects of mathematics, by enhancing intuitions that derive from calculators' graphical and numerical processing capabilities and provide proper context and motivations for subsequent formal analysis. Moreover, calculators and computers favor teaching/learning activities through the mediation of modern and captivating languages, able to propose contents in an interactive and innovative way, close to students' attitudes and habits, and to encourage cooperative learning.

Using graphing calculators in a class is less expensive and cumbersome than using computer laboratories, but, eventually combined with the use of simple and cheap controllers, not less powerful.

Calculators pose various educational challenges. Italian teachers are particular concerned with evaluation, which they consider a very crucial one, especially after recent changes in the structure of the final exams, as briefly recalled in the introduction.

If we want to evaluate learning processes about "controlling computations" we need to specify better what we mean by that.

We limit ourselves to recall three aspects of it:

1. Get a qualitative/heuristic idea of what we compute and what we expect to get by computation
2. Link computing procedures in order to build algorithms
3. Link different views (numerical, graphical) on a given set of data.

The Steps of Our Research

The reason behind our involvement in teachers' training on the use of graphing calculators comes from the request of devising a new model for a more effective training. We devised this model proceeding along the following steps:

1. Analysis of the characteristics of training as offered by various graphing calculators' companies;
2. Analysis of teachers' opinions about criticalities;
3. Design and analysis of specifically devised experimentations conducted in collaboration with the group of trainers;
4. Elaboration of the new "collaborative training model";
5. Experimentation of the model in some pilot experiences;
6. Trainers training;
7. Nationwide delivering of 50 collaborative trainings in the 2018-2019 school year.

The Standard Training Model and Its Ineffectiveness

The standard training model, adopted by all calculator companies in its essential features, is based on a single meeting between a group of teachers and a trainer. The meeting lasts two or three hours, during which the main commands and the possible use of the calculator in the various areas of mathematics are presented.

The strength of this presentation-based method is that of packing a lot of information with extreme synthesis, that is to say that many features of the graphing calculator are briefly illustrated. The standard training is based on a model of vertical interaction, from trainer to teachers, which leaves little space to individual work, which teachers are assumed to do later. With this model the risk of being puzzled and forgetting everything is very high. The typical reaction of teachers is epitomized by the following phrase, which we have collected in our interviews:

"When the trainer showed us the potentialities of graphing calculators, I thought: amazing, but I will never be able to do it!"

The weakness of this training is also due to its duration, which is too short and needs to be split in more meetings. It is highly probable that all the information acquired during the meeting cannot be easily connected with daily teaching practice.

After a standard training, most teachers are amazed by calculators but scared to be left alone with them. Moreover, many teachers said that they could not understand how the activities shown by the trainers could have been used in their daily teaching.

Designing a New Training Model

The purpose of this research has been to develop collaborative trainings on the use of

the graphic calculator, based on a model of global interaction. In the intent of making teaching more effective we promote cooperation between trainer and teachers and between teachers and students, both in training meetings and during the classroom activities designed by teachers with the help of the trainer.

The trainings made use of Casio FX-cg50 graphing calculator and have been delivered in 50 upper secondary school classes in Italy.

The collaborative training model is intended, in particular, to meet the demands of teachers who are skeptical (Type B) or doubtful about the usefulness of graphing calculators in everyday teaching (Type C) or afraid to learn how to use this new tool (Type D).

We place teachers' needs at the heart of the activities by involving them in deciding the contents of the training according to the following scheme:

1. At the beginning of each training, teachers propose a list of topics that they intend to teach in their classes in the next weeks;

2. Trainer makes teachers practice the fundamental functions of the calculator related to the chosen topics;

3. Teachers design possible educational activities with calculator that, according to what they practice, they think they could develop in class;

4. Trainer and teachers discuss and redesign the proposed activities in order to transpose them in their classrooms in the most effective way.

A peculiarity of our collaborative model is the idea that a successful training should properly acknowledge the teaching and methodological competencies of teachers and should be based on their needs. The goal is to make teachers aware of the potentiality of graphing calculators in everyday classroom activities and to let them experiment some ways in which they can enhance their teaching during the period of the training.

The methodology envisaged is that of Cooperative Learning, in which trainees work together in small groups to reach common goals, mutually improving their learning, and Peer-to-Peer education, in fact they cooperate for acquiring knowledge. The model of Peer-to-Peer education has proved to be particularly fruitful when, as planned in the first meeting of our training, teachers work also with some of their students. The purpose is to modify the relationship of educational dialogue between teachers and students, who become themselves trainers of their classmates and work alongside the teachers in the activities. Students become reference figures in the classroom and help teachers in administering the activities by cooperating in guiding and supporting their

companions. This will be further explained in the next section.

The Implementation of the Collaborative Training

According to the principles outlined in the previous sections we devised a format for collaborative training delivered to 50 Italian upper secondary schools. At each school one trainer trains the teachers of mathematics of 3/5 classes. At least two students of each class, chosen by their teacher, were asked to participate to the first meeting.

The format envisages three meetings, separated by two weeks breaks. Between the first and the second meeting teachers are required to design classroom activities based on calculators, to be carried out in their classes between the second and third meeting.

In more details, the contents of the meetings are the following.

First Meeting

The first meeting is divided in two parts: one hour and half with trainer, students and teachers followed by one hour and half with trainer and teachers only.

During the first part the trainer introduces the use of graphing calculators through the exploration of the most important menus and functions and the step by step solution of simple exercises, like: finding the approximate root of an equation with given approximation; displaying the graph of a function in a certain window; representing the graph of the derivative of a given function; studying the modification of graphs of a one parameter family of functions,… The trainer develops the activities in cooperative learning between teachers and students. Teachers observe their own students and verify how easily they begin to use a graphic calculator, without detailed explanations, and how effectively they help each other in the discovery of how it works. Contrary to their worries, they realize that there is no need to become experts in the usage of the instrument in order to make students use it effectively. Students do not need to be trained if they are allowed to work together. Rather, they are quick to find how to perform specific tasks with calculator and are very supportive among themselves and with their teacher, which may concentrate more on making sense of what students get rather than explaining how to use the calculator. This helps teachers to overcome the fear of not remembering the sequence of instructions which are necessary to perform a task, relying on the help of their students.

The exercises solved by the trainer to illustrate the use of the calculator in the first part of the meeting are chosen among those which are commonly considered by teachers in their classes in order to highlight the continuity of calculator-based activities with daily teaching and the added value of its graphical and numerical processing capabilities.

In the second part of the first meeting trainer discusses with teachers the program they are going to carry out in their classes in the next two weeks and the possible activities which can be done with graphic calculators to support it. Trainer illustrates the possible use of graphic calculator in some of the activities suggested by teachers (Rogora, 2019) and shows how to prepare activity sheets for supporting the use of calculators in class (Bologna, Rogora & Veronesi, 2019). According to our interviews, teachers greatly appreciated the idea of explaining the use of graphical calculators starting from activities proposed by themselves.

At the end of the meeting, it is decided the activities that teachers are requested to prepare for the next meeting, following the lines already illustrated.

In the days immediately following the first meeting, teachers bring calculators to their classrooms and replicate the activities they have done in the first part of the first meeting, supported by the students who participated.

Before the second meeting, teachers design the calculator-based activity decided at the end of the first meeting, trying to prepare suitable activity sheets. In this phase trainer does not indicate how to set up the activities, but only support teachers on technicalities concerning the use of calculators through a WhatsApp group.

Second Meeting

Two weeks after the first meeting, a second meeting is scheduled, only for teachers, without the participation of students. The first part of the meeting is devoted to a discussion about impressions and feedbacks on the first introductory classroom activity, especially about difficulties and criticalities. Many teachers are surprised by the ease with which the students are able to immediately use the graphing calculator and realize that they are not required to be “omniscient” about the features. In the interview a teacher says:

“Before the training I was very doubtful by the possibility of using it, but I found it a very easy tool when I used it in class, repeating what we experimented and discussed during the first meeting of the training”

In the second part of the second meeting, trainer and teachers discuss and refine the work sheets to be used during curricular activities in the classroom. Calculator based activities encourage cooperative and collaborative learning and many teachers recognized the importance of an articulated discussion during the second meeting among them and with trainer about the possible outcomes of the transposition in class

of the designed activities.

In the weeks following the second meeting, the planned activities are taken in the classroom, either as individual activities where each student has his calculator or as group activities in groups of up to three students.

Third Meeting

During the third meeting, ample space is given to the discussion between trainer and teachers about the results of the activities in class. The strengths are highlighted, and the weaknesses are analyzed. Feedbacks on the outcomes of the activities developed in the classroom are exchanged. Trainer, starting from the highlights of this discussion, shows other possible uses of graphing calculators in activities suggested by teachers.

The observations and reflections of teachers and their suggestions for the organization of future activities have been collected in the form of individual written interviews. Teacher's satisfaction was generally high because they were able to use with small effort an instrument which was very well integrated in their teaching. The use of graphing calculators was perceived more as an amplification of the possibilities of their teaching than as a revolution in it. Actually, we believe that graphing calculators have potentialities which go much further than a simple aid for traditional teaching (Perrotta & Rogora, Submitted), but we also think that the majority of Italian teachers need to be gently introduced to their use by focusing on continuity with their traditional didactics.

Effectiveness of Collaborative Training

Teachers' feedbacks

Various interesting aspects emerged from discussions and feedbacks with teachers. In the feedback forms we asked teachers to complete, among other things:

1. If the teachers' attitude towards graphing calculator had changed during the training and, if so, how;
2. If the topics chosen for the first meeting met their expectations;
3. If the trainer support for preparing activities for their classrooms was well calibrated and non-invasive;
4. Strengths and weaknesses of this training.

About question 1. Some teachers, almost half of them, were quite skeptical about graphing calculators. All of skeptical got a better opinion because they got effective support to smoothly integrate it in their teaching. Some teachers were worried of not

being able to handle in their classes the use of a complicated instrument without a long training. They realized that for students it is not complicated and that students do not need to be helped in its usage but only in making sense of the results they got. They also felt more inclined to continue explore more advanced features with a more relaxed attitude borrowed from their students.

About question 2. Teachers appreciated the simplicity with which is it possible to show with graphic calculators the interconnection between algebraic, geometric and graphic aspect of some mathematical topics: equations, inequalities, differential and integral calculus, regression, … Using a teacher's phrase,

"This training was not aimed at astonishing but at reassuring".

They also appreciated the decision to involve young students coming from second high school classes which resulted very supportive during their classroom activities.

About question 3. Teachers appreciated that the chosen activities were well integrated with their everyday lectures and with their way of teaching thanks to a non-invasive support offered by the trainer.

About question 4. Some teachers found a decisive strength of this training in being "forced" to organize complete activities that gave them the opportunity to learn the potential of the calculator and implement their abilities with guided materials. Other teachers appreciated the wide freedom of choice that has been granted, the discussion, during the second meeting, of their proposals and trainer support for the modification of the activity in order to make possible and immediate transposition in their classrooms. Teachers are often critical about the need to attend refresher courses, about the quality of the content and, especially, the weak connection with their everyday teaching. They appreciated the efforts to overcome these weaknesses, characteristic of classical trainings, with this new model of collaborative training.

Trainers' feedbacks

A monitoring action has been also carried out also on trainers. Trainers acknowledged a high degree of satisfaction with this new training model. They think that collaborative training meets teachers' and students' needs better than standard training, which had a modest impact on teachers' propensity to use graphing calculators.

More than being informed on the possibilities of the instrument (focus of standard training) teachers need to be helped in preparing simple activities for their classes and experience that using the calculator in class is much easier than expected because students do not need much help in being instructed in basic calculator usage.

From the questionnaires it clearly emerged that collaborative training is more demanding and more difficult to organize than the standard one. Teachers involved have difficulty finding time to plan the activities and tend to rely heavily on the trainer, sometimes asking him to carry out the training with students or to foresee an activity in the classroom. This action, even if it has in some cases favored the inclusion of graphic calculators in class, is not in the spirit of the training since the point is precisely to make teachers able to manage the use of calculators in their classes by themselves.

An interesting aspect that emerges is that almost all the trainers have maintained contact with trained teachers. This has facilitated the creation of an active user network for sharing support and materials, open to inclusion of new interested colleagues.

Conclusions

Collaborative training seems a promising new way for training teachers to the use of graphing calculators, more effective than standard training for fostering a daily usage of this instrument in class. To monitor the impact of this training and the effectiveness of graphing calculator usage in the longer run, the research group in didactics of mathematics of the Department of Mathematics University of Salerno in collaboration with expert trainers of CASIO Italia is carrying out an educational research project which has been named “LabClass”.

The results of this project will be illustrated in a future paper.

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Mathematical Knowledge in the Acquisition of Skills in Data Analysis, Catering, and Fashion Designing

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Mathematical Knowledge

Mathematical knowledge is the study of how society can effectively make use of the vast and growing literature on mathematics. Its studies approach such as databases of mathematical knowledge, automated processing of formulae and the use of semantic information and artificial intelligence. Mathematics is particularly suited to a systematic study of automated knowledge processing due to the high degree of interconnectedness between different areas of mathematics. New forms of mathematical knowledge are growing in importance for mathematics and education, including tacit knowledge; knowledge of particulars, language and rhetoric in mathematics. These developments also include recognition of the philosophical import of the social context of mathematics and are part of the diminished domination of the field by absolutist philosophies. From an epistemological perspective, all knowledge must have a warrant and it is argued in the paper that tacit knowledge is validated by public performance and demonstration. This enables a parallel to be drawn between the justification of knowledge, and the assessment of learning. An important factor in the warranting of knowledge is the means of communicating it convincingly in written form, i.e., the rhetoric of mathematics (Moore, 2017).

Importance of Mathematical Knowledge in Skills Acquisition

According to Speelman (2015), a skill is seen as the ability to do something well, usually gained through training or experience. Skill is often acquired after a training session or after a practical. Skill acquisition is the ability to learn or acquire skills. It involves the development of a new practice of a way of doing things usually gained through or experience. Akpama, Esang, Asor, & Osang (2011), observed that the acquisition of vocational skills leads to a significant reduction of poverty among young adults who participated in skills acquisition programmes. Entrepreneurial studies are inter-disciplinary training that focuses on the tools needed to start a new business or vocation. As Nigeria is fast becoming a predominantly youthful society with a high rate of unemployment, it requires educating the youth in entrepreneurship skills in technical and vocational education and training to tackle unemployment which has reached daunt proportions. Similarly, Amadi & Abdullah (2012), reported from their study that a greater percentage of the sampled youth reported high and moderate levels of their capacity building: implying that the vocational skills acquisition and development was a

successful scheme. They, however, recommended that the constraints that impede the success of the scheme should be addressed by policymakers to make the outcome of the skills training more successful.

Mathematical knowledge in Skill Acquisition is enshrined in entrepreneurship which in the context of this study, refers to an individual's knowledge and ability to perform specific tasks successfully. Hence, Anerua & Obiazi (2009), posit that entrepreneurship is the process of perceiving business opportunities, mobilizing both human and material resources and initiating actions under an enterprise that is characterized by risk-taking, innovation, and creativity to meet individual, group or societal needs. Entrepreneurship skills, therefore, are business skills that one acquires to function effectively in the turbulent business environment as an independent or self-employed person to improve one's economic status and the society at large. The importance of entrepreneurship skills acquisition cannot be overstressed since appropriate skills acquisition by means of entrepreneurship will help to make young school leavers be self-reliant and boost their economic status. Mathematical knowledge in entrepreneurship skills acquisition opens one's eyes to forecast business opportunities using appropriate entrepreneurship skills.

Similarly, Adebayo (2013), advocated that the importance of mathematical knowledge in skill acquisition is better achieved through Entrepreneurship Education. He found that entrepreneurial education is best received in the school's settings and that learning by doing is seen as the best approach or method to teach entrepreneurial education. While, Ezeji and Okorie (2019), emphasising the importance of mathematical knowledge in skills acquisition in national growth, emphatically contended that "Nigeria's social and economic problems will be drastically reduced if people are given adequate vocational training in skills, raw materials, types of machinery and equipment". It is only with skilled men that materials can be harnessed, manipulated and transformed into products (ibid., 2019).

Importance of Mathematical knowledge in Data Analysis

An analysis is breaking down a whole into its separate components for individual examination. Data analysis is a process for obtaining raw data and converting it into information useful for decision-making by a user (Schutt and O'Neil, 2013). Also, Data analysis skill can be referred to as the ability to collect and organize data such that it is translated into meaningful information. It is the ability to use one's analytical and logical reasoning to evaluate the collected data (Clever, 2019). Studies have shown that these skills require gathering data from various sources, reviewing it, as well as analysing it to discover certain findings, conclusions or useful information to support decision-making. Of recent, every single organization makes attempts to gather data, for instance, by monitoring its competitors' performance, sales figures and buying trends, etc. to be

more competitive (ibid., 2019).

Mathematical knowledge in data analysis is a necessity for making well-informed and efficient decisions most especially in helping an organization to ascertain their positions in the market relative to competitors, identify the potential risk that need to be avoided, and the opportunities that must be grabbed in order for the organization to grow. Data are gathered from a variety of sources and the data analyst process, organize, and communicates requirements of the data to the custodians of the data. Data analyst may apply Mathematical formulas or models called algorithms to the data to identify relationships among the variables, such as correlation or causation (Clever, 2019).

Similarly, Mathematics serves as the bedrock of any contemporary discipline of science as almost all the techniques of modern data science, including machine learning, have a deep mathematical underpinning. Mathematics and Statistics are two of the most important concepts of Data Science. Research have also shown that Data Science revolves around these two fields and draws their concepts to operate on the data. Statistics, on the other hand, is the study of the collection, analysis, visualization, and interpretation of the data. Statistics deal with raw data and helps the industries to take careful data-driven decisions (Dataflair, 2019). Meanwhile, a Data Scientist, specializing in Data Science uses various statistics and machine learning algorithms not only to analyse the data but also to predict future occurrences of an event. Data Science as a field which deals with data processing, analysis, and extraction of insights from the data using various statistical methods and computer algorithms, is a multidisciplinary field that combines mathematics, statistics, and computer science (ibid., 2019).

Mathematical knowledge in data analysis will enable a student to draw conclusions or inferences from the data. Mathematical knowledge in data analysis helps business organisations, marketers or merchandise to use Data to analyse their marketing strategies and create better advertisements. Many a time, businesses spend an astronomical amount on marketing their products which, most of the times may not yield expected results. Therefore, by studying and analysing customer feedback, companies can create better advertisements. The companies do so by carefully analysing customer behaviour online. Also, keeping a check on customer trends helps the company to get better market insights. Therefore, businesses need Data Scientists to assist them in making strong decisions regarding marketing campaigns and advertisements. Likewise, Data Scientists help companies to acquire customers by analysing their needs with the help of mathematical knowledge. This in a way allows the companies to modify products best suited for the requirements of their potential customers.

Similarly, research have shown that Mathematical skill in data holds the key for companies to understand their clients. With the help of mathematical skills Data

Scientists enables companies to recognize clients and help them deliver the needs of their customers. Beyond using statistical techniques to conclude, a data Scientist's goal is to communicate his results with the company. Hence, a Data Scientist needs not only to be proficient in number-crunching but should also capable of translating the mathematical jargon for taking proper business decisions (Dataflair, 2019).

For example, consider a Data Scientist analysing monthly sales of the company, he uses several statistical tools and Mathematical skills to analyse and draw conclusions from the data. In the end, he obtains results that he needs to share with the company. Hence, Data Scientist needs Mathematical knowledge to know how to communicate results in a very concise and simple manner. In the same vein, technical results and processes may not be understood by the people managing sales and distribution, therefore, the Data Scientist must be able to story tell. The storytelling of data will allow the Data Scientist to transfer his knowledge across to the management team without any hassle (Dataflair, 2019).

Mathematical Knowledge and Catering Skills Acquisition

Catering is the business of making available food service at a remote site or a site such as a hotel, hospital, pub, aircraft, cruise ship, park, filming site or studio, entertainment site, or event venue. The foremost priority of catering skills is the preparation of young people for the catering occupation. For this, they need to acquire mathematical knowledge to be able to communicate the knowledge and skills (Moore, 2017).

Besides, accounting and bookkeeping skills are necessary to understand the financial aspects of managing a catering business as the ability to prepare and interpret financial statements is essential. It is also crucial to understand the legal aspects of catering. Hence, a caterer, like any other businessperson, must have some human resource skills. Similarly, knowing how to recruit, train, motivate, and manage personnel is critical and necessarily dependent on Mathematical related skills and knowledge (Manfred & John, 2014). Caterers' knowledgeability in Mathematical skills is a necessity to develop and implement a marketing Plan, Organize, Execute, and Control the business which is the four basic functions of management in catering. However, Catering is a very risky business that depends on Mathematical knowledge and catering skill as it the caterers to know when the risk outweighs the gain (ibid., 2014).

Creativity is the standard of all outstanding caterers. Management and other personnel with Mathematical knowledge and skill will have a greater impact and a level of success in the workplace than their counterparts with weak mathematical knowledge and skill. Personnel with Mathematical knowledge and skill can turn the client's vision into reality by creating the suitable look, feel, menu, service, and environment. In essence, Mathematical knowledge in catering skills helps the caterer to know that the needs of

the client must always come first. Success in the catering business comes from identifying these needs and satisfying them. Therefore, Caterers that are not Mathematics experts are those who get lost in trying to satisfy their own needs for money, equipment, and greater self-esteem. They forget that the primary goal is to serve the needs of the client. When a client's needs are met, the caterer's needs for revenues, profits, and positive feedback will be met automatically. The success of the business depends on the caterer's Mathematical knowledge (Jefferson, 2017).

Likewise, strategic planning is a roadmap to help a caterer determine the direction in which he/she wishes to go, and the specific goals he/she will need to accomplish to get there. Mathematics provides a strategic plan with a statement of core values, which may include things like client satisfaction; ethical business practices; staff satisfaction, training, and motivation; community service; and operating an environmentally conscious business. Mathematics also plays a core value, by helping caterers to develop a vision and mission statements. The mission statement is a succinct sentence that sums up the business mission. For example: "To meet the catering needs of the corporate community, providing high levels of service and food quality that result in repeat business and vital growth." While the vision statement is a concise summary of where you want to be in the future (Manfred & John, 2014).

In the same way, Mathematical knowledge in catering skill help caterers to make decisions that keep their operations running smoothly. With the help of Mathematical knowledge, caterers realize that that there is no perfect solution to every problem, some decisions will be better than others, and that the best decision-making goal is to find the best possible solution with the least number of drawbacks. Additionally, Mathematical knowledge in catering skills helps caterers to choose the best alternative; make decisions that help achieve the business objectives, allow quality time for planning and decision making, realize that no one will ever please everyone and put decision making in perspective (Mike, 2012).

One more important thing that requires mathematical knowledge in catering skills is Time Management. Studies have equally shown that Mathematics experts in catering have realized that if they can accomplish more meaningful production in less time, they will have more time for things other than work. They also realize that working smarter, not harder, through the effective use of time will produce greater results (Manfred & John, 2014). Hence, a key to effective time management is the ability to set goals for a day, week, month, a year, several years and lifetime. Mathematics experts use some of the tips for putting smart goals in writing, not just for "big picture" goals, but as part of their daily business. Without written goals, caterers cannot effectively manage their time. Since time management involves choosing how to spend time, a caterer can't make proper choices without knowing his/her desired goals (ibid., 2014).

Mathematical Knowledge and Fashion Designing Skills Acquisition

In the fashion industry, after the designer has finalized to make available a new fashion product in large quantity on demand by consumers, it involves a multitude of process such as fashion making, marketing, and (Buttle, 2013). Beginning from the designing to the manufacturing process for the global market and onward to vendors, retailers, and consumers, the merchandising/marketing workforce is increasingly dependent on mathematics-related skills and knowledge (Garrett, 2008). In most instances, these skills are simple computations and applications of mathematics that are addressed early in one's education. Personnel with mathematics expertise will have a greater impact and level of success in the workplace than their counterparts with weak mathematics capabilities (Breiner, Harkness, Johnson, & Koehler, 2012).

Producers and retailers in the fashion industries are faced with the challenge of doing more with less. Fashion marketers and merchandisers need to possess a requisite understanding of the construction of manufactured items and manufacturing processes to determine the types of suitable materials along with the estimation of material costs and how best to package and deliver items once produced (Baker, 2004; Borin & Metcalf, 2010). Again, Mathematics in the fields of marketing and merchandising (FMM) is an essential skill. Therefore, curricula in FMM programs need to integrate key mathematics concepts within the marketing and merchandising acumen (Hines and Bruce, 2007). Emphasis on FMM is to make certain the right product is delivered to the customer at the right time, at the right price, in the right place, and the right quantity (Jackson & Shaw, 2000). Similarly, Mathematics is a tool that helps one accomplish all of these factors as the fashion businesses often outsource much of their apparel manufacturing operations overseas. As a result of such practices, employees must have an expert understanding of cross-cultural complexities including import/export rates and tariffs/taxes (Sen, 2008).

With the increasing globalization and innovations in technology, industries' needs require the integration of additional Mathematics skills and knowledge (Sen, 2008; Kincade, 2010). Familiarity with Mathematics skills and applications enhances students and future merchants with understandings that are critical for problem-solving and decision-making in a globalized world of manufacturing and retail (Community Report, 2012). Furthermore, Globalization brings changes in resources as well as fashion trends. Hence, the International Textiles and Apparel Association (ITAA) defines globalization as the interaction of the design, product development, and merchandising processes in a global marketplace (Ko & Megehee, 2012). Designers focus on introducing a finely blended amalgamation of eastern and western trends. This increase in cross-cultural sources, as well as changing the pattern of fashion trends, requires exceptional decision-making skills of the fashion merchandiser/marketer to make appropriate evaluations

regarding the selection of the materials, manufacturing, packaging, and distribution to meet customers' demands of cost-effective business plan of actions.

Forecast of future business trends in fashion requires business mathematics acumen to be able to understand past losses and challenges as well as the ability to predict future expenditures and earnings (Behrman and Levin, 2014). This has made the clothing and textile industries to employing individuals with expertise in manufacturing, distribution, and marketing. Even though it may appear that Mathematics or Science, Technology, Engineering, and Mathematics (STEM) coursework is not critical to fashion, it should be stressed that in fashion industry-related programs, STEM concepts, particularly mathematical concepts, are necessary (Shirley & Kohler, 2012). For example, in the production of cotton, which is one of the most widely produced fibres used in the fashion industry, mathematics plays an instrumental role. Evaluating the process of manufacturing cotton fabric to produce apparel like jeans requires students to conceptualize mathematics (Cohen, 2016).

Many may not be aware that it takes roughly 24 ounces of cotton fibre to create a pair of jeans, which may be important to note from a cost analysis perspective. The interpretation of such costs entails mathematic skills and allows marketers and merchandisers to analyse components involved in the big picture of product development and sales. Mathematics also plays a critical role when it comes to the distribution phase of the fashion industry. Finished products are disseminated across retail stores, online websites, and wholesale locations worldwide. This requires graduates of FMM programs to be well-versed in the use of technology operations and concepts, which requires knowledge and application of mathematics (Shirley & Kohler, 2012).

Also, marketers/merchandise should be of the know on how to understand the environmental effects of their fashion products from the beginning design process through its final delivery. Possessing the knowledge and ability to apply mathematical principles to calculate specific metrics of energy consumption, emissions, water use, and sustainability of the fashion product is vital to a company's success (Sproles, 2011; Shirley and Kohler, 2012). Some industries require taking a suitability test, which has a range of different questions where most are mathematically oriented, to establish the best placement of employees. Numeracy skills are needed for many of these entrance exams (Zevenbergen, 2011). In one case, job seekers aiming for work producing foam textile products in the aerospace industry must take and pass a mathematics test before being eligible to complete an application. Whereas, potential applicants must complete this eighteen-problem test within thirty minutes with no calculator. The test includes problems where one must convert inches to feet, read a tape measure, and find the density of a block of foam (mass divided by volume). Mathematics knowledge empowers students with an insight to operate successfully in a globalized world of

manufacturing and retail (Yu and Jin, 2005; Schoof, 2013).

Conclusion

Mathematical knowledge is a study approaches such as databases of mathematical knowledge, automated processing of formulae and the use of semantic information and artificial intelligence. It is observed that the acquisition of vocational skills leads to a significant reduction of poverty among young adults who took part in skills acquisition programmes. Entrepreneurial studies are inter-disciplinary training that centers on the tools needed to start a new business or vocation. Mathematical knowledge in acquisition opens one's eyes to forecast business opportunities using appropriate entrepreneurship skills. The importance of mathematical knowledge in skill acquisition is better achieved through Entrepreneurship Education. Mathematical knowledge in data analysis is a necessity for making well-informed and efficient decisions. It is what helps us identify the potential risk that needs to be avoided and the opportunities that must be grabbed to grow. From the design process to manufacturing for the global market, and onward to vendors, retailers, and consumers, the merchandising/marketing workforce is increasingly dependent on mathematics-related skills and knowledge.

Recommendations

1. Students' knowledge in Mathematics is not to be based on cognitive knowledge only.
2. Student's knowledge in Mathematics should be constructivism.
3. Teachers of Mathematics should have vast knowledge not only in their field of study.
4. Curriculum planners should design the Mathematics curriculum by incorporating skill acquisition.
5. Seminar should be organized for Mathematics teachers to acquire skills for them to impact those skills to students while teaching in the classroom.

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SECTION 2
TEACHING AND LEARNING

Assessment and Evaluation of Student Learning in Citizenship Education in Japanese Junior High Schools

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Introduction

Citizenship formation is an important goal of any education system in the world. In Japan, the primacy of citizenship education is evident in the country's Fundamental Law of Education which states that the overall aim of education is the cultivation of individuals who are "imbued with the necessary qualities to build a peaceful and democratic society". In order to achieve this, education should therefore foster the "values of respect for justice, responsibility, equality between men and women, and mutual respect and cooperation, as well as the value of actively participating in building our society and contributing to its development" (Article 2, Fundamental Law of Education 2006 revision). As a democratic society, Japan recognizes the significance of citizenship education since the exercise and continuation of democratic ideals rest in the hands of active, informed and engaged citizens. The Ministry of Education, Culture, Sports, Science and Technology (MEXT), therefore, has established learning areas in the curriculum where citizenship can be cultivated, the foremost of which are Social Studies and Moral Education. Through the national curriculum guidelines called "Course of Study", MEXT has laid down the basic framework for goals and content for citizenship education. However, considerable freedom and flexibility are given to schools and teachers when it comes to learning approaches and evaluation, resulting into a variety of practices in the development and implementation of these curriculum elements (Tanahashi in Ikeno, 2011).

While there is substantial literature dealing with goals, content, and learning approaches in citizenship education, there seems to be a dearth of discussion regarding the equally important element of evaluation. This deficiency is not unique to Japan, however. In fact, assessment and evaluation are rarely mentioned in citizenship education studies anywhere and only a few scholars explore the topic. Kerr (2002) argues that this is due to the belief that it is inappropriate to make assessment and evaluation in citizenship education by labeling young students as "good" or "failing" citizens. People who subscribe to this notion of assessment and evaluation seem to equate the processes with mere comparison of student performance and overlook their more important purposes. Assessment and avaluation provide students an opportunity to reflect on their strengths and weaknesses by providing useful feedback on the development of their skills, and attitudes needed for citizenship. Moreover, evaluation is necessary in improving curricula, raising the educational standards, and ensuring the coherence of goals, content, and learning activities in citizenship education. Assessment and

evaluation are not an easy task, especially in the field of citizenship education. But it must be done since the discipline is the primary means of achieving the major aim of education which is the development of active and responsible citizens.

This study aims to contribute to closing the gap in the literature on assessment and evaluation in citizenship education by examining the framework and practices used in the context of Japanese junior high schools. Through a review of previous researches, policy documents, instructional guidebooks, and textbooks, this study specifically answers the following questions:

1. What are the core learning outcomes that guide the evaluation of student learning in citizenship education?

2. How are these learning outcomes measured, assessed, and evaluated in junior high schools?

Essentially, these questions correspond to the two components of an assessment or evaluation framework: the learning outcomes of a program of study and the details of how their achievement can be measured (Pearce, et. al., 2015). Learner outcomes refer to the knowledge, skills, capabilities, values, attitudes, and other attributes that students need to demonstrate as evidence of learning. The second component, on the other hand, describes the various tasks such as the setting of specific criteria or indicators, formative and summative assessment practices, as well as the recording and the reporting of assesment and evaluation.

Brief History and the Structure of Citizenship Education in Japan

The practice of citizenship education varies greatly between countries since there is no single, unified concept of citizenship. This is particularly true in the case of Japan where there are three conceptions of the word “citizen”. Citizen can either be translated as *shimin* which means “a private citizen”; *koumin* which refers to a “citizen based on natural law”; or *kokumin* which means “a national citizen” (Taniguchi in Ikeno, 2011). This variety of conceptions has shaped the practice of citizenship education in Japan, which is evident in the various names and purposes it served over the ages. Historically, citizenship education started in Japan during the Meiji Restoration in 1868. As one of the many modern ideas imported by Japan from the West, citizenship education was carried out in a subject called “Koumin” or Civics, which primarily dealt with law and economics (Taniguchi in Ikeno, 2011). During the wartime era until 1945, all school subjects were merged into a single course called “Kokumin-ka” or Nation which became an instrument for indoctrination and ultranationalism. When the United States occupied Japan after the war, the modern form of citizenship education took shape with the purpose of promoting a peace-loving and democratic society. “Shakai-ka”, which is

based on American Social Studies, became the primary means of citizenship formation. When the Americans left, the purpose of citizenship education remains to be the development of citizens who will form democratic societies in the future (Parmenter, et. al. in Arthur, Davies, and Hahn, 2008). But citizenship education began to take a distinct Japanese orientation.

The distinct form of Japanese education refers to the educational system's dual structure (Table 1). According to Ikeno (2011), education in Japan is essentually dualistic, composed of academic education and social education. The former is given formally in schools while the latter refers to non-formal learning opportunities that exist independently of the school curriculum. Providers of non-formal education include the juku or cram schools, proprietary technical and vocational schools, and lifelong and training programs of corporate organizations. The support provided by non-formal education to the Japanese formal school system is substantial and the existence of this dual system is believed to be the reason why Japanese education is deemed effective in terms of academic achievement, droup-out rates, and cost-effectiveness (Guo, 2005).

In citizenship education, the domain of social education is mainly supported and provided by programs of the local communities and volunteer activities organized by non-government organizations (NGOs) and non-profit organizations (NPOs) (Ikeno, 2011). These volunteering activities, which mainly center on education and peace-bulding, disaster relief, and the environment, provide great opportunities for young people to become actively engaged in social issues and learn practical civic skills. While the domain of social education is regulated by the Ministry of Health, Labor and Welfare, On the other hand, the formal schooling is directed by MEXT. Often, the policies of these two government agencies regarding citizenship education lack coordination, and sometimes, go in different directions (Ikeno, 2011; Parmenter, et. al in Arthur, Davies, and Hahn, 2008).

The scope of this research is focused on citizenship education provided in the formal or school setting. Many authors agree that citizenship education in Japan is primarily and explicitly cultivated through four curriculum subjects (Higashi in Cogan & Grossman, 2012; Ikeno, 2011; Parmenter, Mizuyama, & Taniguchi, 2008; Otsu in Grossman, et. al.; McCullough, 2008; Willis, 2002). The first and foremost subject considered to promote citizenship education is the Social Studies. Although the Course of Study has been revised many times, the aim of Social Studies remains to be the "cultivation of civic qualities necessary in building a peaceful and democratic nation while living in an international society" (Ikeno, 2012). In junior high school, Social Studies or "shimin-ka" is composed of Geography, History, and Civics. Civic education is considered most central to citizenship education as it provides students with the knowledge and understanding of political, economic, and social institutions as well as the processes of

civic life. However, the strongly academic approach towards the teaching of the Social Studies and the limited time for problem-solving and active engagement in social issues have been criticized for not maximizing the opportunity to teach active citizenship.

Table 1. Citizenship Education Under the Dual Structure of Japanese Education (Ikeno, 2011)

Fomal/School/Academic Education	Non-formal/Social Education
- includes classroom-based learning and school-directed extra-curricular activities; - directed by Ministry of Education, Culture, Sports, Science & Technology (MEXT)	- includes local community programs and volunteer activities offered by NGOs and NPOs; - - regulated by the Ministry of Health, Labor, and Welfare (MHLW)
School subjects that primarily cultivate citizenship education: 1. Social Studies (Geography, History & Civics) 2. Moral Education 3. Special Activities 4. Period of Integrated Studies Subjects that support the cultivation of citizenship education: 1. Language Education (Japanese and foreign) 2. Arts and Music 3. Home Economics	Engagement on activities tackling social issues and promoting civic skills, particularly on the field of education and peace-building; disaster management and emergency relief, and the environment.

Other authors consider moral education or “Doutoku” to be the closer equivalent of direct program for citizenship education (Otsu, 2010; McCullough, 2008). Banned after the war and reintroduced in 1958, the current Moral Education aims to foster morality as a foundation for developing Japanese citizens who respect human dignity, value culture and tradition, love their country, and contribute to the development of democracy and peace in the international community (MEXT, 2018). Its contents are divided into four aspects: self-awareness, relations with other people, relations with groups and with society and relations with nature and the universe. These contents are directly linked to the contents of citizenship education which include understanding of the significance of the group, social roles and responsibilities, rights and duties, public spirit and social solidarity, etc. (Parmenter, et. al in Arthur, Davies, and Hahn, 2008).

Another curriculum subject that develops citizenship education in Japan is Special Activities. This subject aims for the holistic development of students by deepening their self-awareness and independence as human beings and their responsibility to contribute to the buiding of their community and society. This subject has three fixed areas of learning: class activities, school events and student council activities. As this subject offers a lot of experiential learning and group activities, it is considered to be promoting the “active learning” in citizenship education (Parmenter, et. al in Arthur,

Davies, and Hahn, 2008). The range of activities conducted, however, varies as each school can decides the content within each area of activity.

The last major area that countributes to citizenship education is the Period of Integrated Studies. Introduced in 2000, this area is created for cross-curricular studies where students can apply the learnings they had in other subjects, develop problem-solving skills, and learn how to learn, thereby by developing what MEXT termed as the "zest for living" of an individual. The particular content or themes covered in this class include international understanding, environment, welfare, and information technologies. Such contents and the emphasis on practical skills make this subject an important area to develop citizenship education (Parmenter, et. al in Arthur, Davies, and Hahn, 2008). In fact, the subject's focus on global issues has provided platforms for multicultural citizenship education efforts in Japan evident in such studies as Education for International Understanding, Human Rights Education, etc. (Willis, 2002).

This study focuses on describing the assessment and evaluation framework and practices of the four aforementioned subjects. However, it is worth mentioning that citizenship competencies are also also nurtured in other subjects in the curriculum. This include language education, both Japanese and foreign. Although others would argue that citizenship is not the explicit purpose of language education, no one can deny the fact that language is fundamental in identity formation, which is the root of all kinds of citizenship education (Bell, 1999). Language education cover the lives, customs, stories, geography, and history of the people of Japan and the world which deepen their cultural and international perspectives (Parmenter, et. al in Arthur, Davies, and Hahn, 2008). Art and music education, on the other hand, promotes deep understanding of national identity, appreciation of differences, and collaboration (Enslin & Hurtado, 2013). According to Arai (2014), even home economics contributes to citizenship education by focusing on the concept of "consumer citizen" which is defined as "individual who makes choices based on ethical, social, economic and ecological considerations and actively contributes to sustainable development by caring and acting responsibly on family, national and global levels".

Assessment and Evaluation of Citizenship Education Subjects

Norm-referenced assessment was the common approach of assessing student learning when education was reorganized in Japan after World War II. This approach was considered easier to use and served the purpose of ranking the ability of students which was crucial in the highly competitive educational climate at that time when students are tracked for specific educational opportunities (Ninomiya, 2016; Tanahashi in Ikeno,

2011) However, that changed in the 1970s when Bloom's taxonomy of educational objectives was introduced. That started a shift to criterion-referenced assessment, the completion of which was done in 2001 when the National Institute for Educational Policy Research (NIER) published the National Assessment Norms and Standards. This document, which was revised in 2010, became highly influential in the evaluation practices of schools in Japan as it describes in detail the evaluation standards for each subject. The document also encourages and presents specific examples of how each school can create their own indicators to achieve the standards.

Generally, the assessment of student learning in major subjects is measured against four main criteria or "evaluation viewpoints". These viewpoints include 1) interest, motivation, and attitude; 2) thinking and judgment; 3) skills and expression; and 4) knowledge and understanding. *(Please explain the general content of each of these viewpoints)*. Through the use of these evaluation viewpoints and standards, teachers would know how far the objectives of the Course of Study have been achieved. In MEXT documents and Japanese research literature about evaluation, this form of criterion-referenced assessment is often referred to as "absolute evaluation" or "goal-compliant evaluation".

NIER has drawn up the general standards for Social Studies (Table 2) and specific standards for each of its components, i.e. History, Geography, and Civics. Among the four primary subjects that cultivate citizenship education, Social Studies is the only one deemed an official subject. Moral education, Special Activities, and Period of Integrated Study are considered "non-subjects" because there are no official textbooks and any subject teacher could (and are made) to teach them (Nishino, 2017; Bolton, 2015; Shinagawa Board of Education in Ikeno, 2011). Moreover, student learning in these subjects are not formally assessed in the sense that no grades or marks are given. But written assesments are provided for these "non-subjects". Surprisingly, while NIER did not include standards for Moral Education and Integrated Studies, it has prepared standards for Special Activities (Table 3). This is probably because the Special Activities subject has three fixed areas of activities in the Course of Study while the content of Integrated Studies is largely decided by each school. Moral education, on the other hand, are not formally assessed since it is generally agreed that values cannot be objectively assessed (Print, 1992). However, this has changed starting school year 2018-2019 as student performance in Moral Education will also be given written assessments in an effort to upgrade of Moral education which is an important focus of the newly revised Course of Study (MEXT, 2018; Government releases guidelines..., 2015).

Table 2. Evaluation Viewpoints and Standards for Social Studies (NIER, 2010, p. 37)

Evaluation Viewpoint	Interest, Motivation, and Attitude regarding social issues	Social thinking, judgment, and expression	Skills in utilizing documents	Knowledge and understanding about social issues
Standards	Shows interests in social issues; investigates them eagerly; reflects on what makes a good society, fulfills responsibilities with full awareness.	Identifies problems in society; consider their significance, characteristics, and relationships with each other; use various ways to judge them fairly, express the process and results properly.	Selects and uses information from various sources concerning social events appropriately.	Acquires knowledge and understanding about the significance and characteristics and connection between social issues

Table 3. Evaluation viewpoints and standards for Special Activities (NIER, 2010, p. 193)

Evaluation Viewpoint	Interest, motivation, and attitude towards living and group activities	Thinking, judgment, and practice practice as a member of a group or society	Knowledge and understanding about living and group activities
Standards	Shows interests in group activities in school and in the classroom; actively tries to contribute to group activities and enrich one's own life while building desirable human relationships.	Recognizes one's role as a member of a group and society; practices and utilizes proper judgment and thinking to improve one's own life and that of the group while buidling desirable human relationships.	Understands the significance of group activities such organizing discussions to gather opinions about better and healthier living.

For Japanese educators who equate or consider Citizenship Education primarily as Social Studies, the standards are deemed sufficient. However, for those who view otherwise, these standards are lacking and doesn't promote a holistic view of citizenship education, especially since the approach to Social Studies in the classroom has become highly academic and focuses on knowledge transfer (Toda in Ikeno, 2011; Network for Promoting Citizenship Education, 2004). Educators argue that this is due to the diminishing time alloted to the subject in the curriculum and the fact that Social Studies is one of the tested subjects in the highly competitive national achievement tests and college entrance examinations. Teachers focus on the teaching of knowledge and facts for the test, making Social Studies devoid of actual participation essential to citizenship education.

Certain educators and researchers have criticized this kind of citizenship education and, thus, proposed new theories or approach to the subject. One group argues that citizenship education should be taught as a subject independent of Social Studies while another group proposes that a citizenship education subject that would replace Social Studies (Toda in Ikeno, 2011). Kodama, for example, proposes that citizenship education should aim to produce politically independent individuals who are active in making practical decisions in society. He thinks citizenship education should be provided as a separate subject where students can engage in volunteer activities and non-profit organizations, etc. According to him, this would create a new type of citizens—the

active citizens who contribute—who are different from the old type who are passive and whose only role is to be a beneficiary of public service (Toda in Ikeno, 2011).

Another theory of citizenship education that has gained popular grounding in the recent decades is formation of citizens with a global mindset. A number of scholars are pushing for this especially since many of the current social issues in Japan such as the environment, economic growth, immigration, and multiculturalism are directly tied to globalization. One significant step toward this effort has been made when the Ministry of Economy, Trade, and Industry published a report titled "Declaration on Citizenship Education" in 2006. Primarily concerned with the economic literacy and career development of the youth, METI created the report in line with the National Youth Development Plan of MEXT and MHLW. METI saw the career education of the youth in the broader context of citizenship education which they defined as the "development of qualities and abilities of the youth who will support Japan in the future" (Hashimoto, 2010). The report proposes a list of competencies necessary to demonstrate citizenship based on recommendations and materials from Japanese non-profit organizations (NPOs), selected Japanese private schools, and US and UK schools and universities. These three major categories are: consciouness, knowledge, and skills (Table 4). These three categories have been adopted as evaluation viewpoints by certain schools in Japan in their attempt to offer a more holistic approach to delivering and assessing citizenship education.

METI's outline of competencies share many commonalities with that of the National Assessment Standards by NIER. However, one thing that stands out with this framework is its explicit emphasis for a citizenship education that is responsive to globalization, multiculturalism and diversification of society. In fact, it defines citizenship as the "exercise of rights and obligations of an individual who actively contribute to the betterment of a society that is composed of diverse values and cultures" (METI in Fujiwara, 2008). This framework seems to promote what Willis (2002) described as a more "open, outward-looking, and inclusive conceptualization of citizenship". This conception of citizenship is somehow different from the type of citizenship promoted by MEXT in schools which emphasizes national identity and nationalism. Some educators and scholars, interest groups, and the mass media even accuse MEXT's approach to citizenship education as "exclusive, inward-looking, nationalistic and based on images of a monoethnic identity (Anzai, 2015; Willis, 2002). The implementation of this approach to citizenship along side with the global citizenship efforts is creating friction and confusion.

Table 4. 2006 Ministry of Economy , Trade and Industry 's Framework of capabilities necessary to demonstrate citizenship education (Kanagawa Prefectural General Education Center, 2009)

Consciousness	Consciousness necessary to cooperate with other people and have active involvement in society. • Consciouness about oneself (Inquisitiveness, motivation to learn and improve oneself, willingness to work, etc.) • Consciousness concerning relationships with others (Respect for human rights and dignity, respect for diversity and multiculturalism, tolerance for differences, mutual aid, spirit of volunteerism) • Consciousness concerning involvement in society (Awareness and compliance on rules and regulations, participation in politics, contribution to society, awareness on environmental and sustanaible development issues)		
Knowledge	• Knowledge necessary for activities in the public and social fields	• Knowledge necessary for activities in the political field	• Knowledge necessary in the economic field
	Culture, history, philosophy, social norms, environmental problems, Universal Design, North-South problem, NPOs and NGOs, etc.	Mechanisms of democracy, sovereignty, representation system, division powers, electoral system, political parties, citizens' rights, responsibilities and duties, basic legal system, structure of government, people's movements, resident participation, information disclosure, conflict and peace, international politics, etc.	Market principle, business economy, capitalism, borderless economy, consumer rights, rights of workers, existence and contents of various professions, tax system, social security system (pension, insurance, etc.), finance, investment, finance, households, medical and health (including drugs and food), dealing with unfair commercial law, various harassment, crime, illegal acts,corporate social responsibility, etc.
Skills	Skills necessary in making a contribution to a society composed of diverse values and attributes ■ Skills to objectively and critically recognize and understand the state and relationship of self, others, and society (ability to understand and see things critically) ■ Skills to effectively collect information and knowledge and understand and judge correctly (ability to gather necessary information from a large amount of information and perform effective analysis, ICT · media literacy, value method; logical thinking ability, ability to set tasks, planning / planning ability, etc.) ■ Skills to express one's opinion to others, listen to others' opinions, and make and execute decisions		

Both the National Assessment Norms and Standards and METI's Declaration of Citizenship specify the purpose, viewpoints and content standards that need to be assessed in citizenship education. As such, they can be classified as outcomes frameworks as they explan "what" is to be measured. However, neither of them describe in detail how the achievement of the outcomes can be measured. The National Assessment Norms and

Standards, for example, only encouraged schools to use the standards and presented examples of how schools can create their own criteria or indicators for each standard. The schools are given the freedom to come up with their own assessment tasks and tools. The next part will discuss how these evaluation viewpoints and standards are used and considered in selected junior high schools and school districts.

Evaluation of Citizenship Learning in Junior High Schools

The junior high schools included in this list were selected based on the availability of information regarding the school's student learning evaluation and assessment practices in citizenship education. Most of the data about these schools are gathered from published books and researches, guidebooks, schools' websites, and textbooks.

1. Hiroshima University - Attached Junior High School

The information on the assessment practices of this school is based on Kenji Tanahashi's research, which serves as the last chapter of the book, Citizenship Education in Japan (2011), a seminal work on the topic edited by Norio Ikeno. As a university-affiliated school, this junior high school serves as a laboratory or "teaching school". In assessing student learning in citizenship education, it uses the National Norms and Assessment Standards as a reference. It adopted the four viewpoints for evaluation in Social Studies and used it to develop their own specific criteria and standards. Table 5 below shows samples of assessment standards used in the subject of Civics for third year junior high school students. Civic here is composed of te following four teaching units: 1) analysis of modern society through an overview of Japanese history; 2) Japanese politics; 3) the Japanese economy; and 4) international society (Tanahashi in Ikeno, 2011).

The table shows which particular viewpoint is assessed by the standards and the methods of measurements to be used for it. As one can see, the standards are stated very broadly and no specific indicators or criteria are included. In the entirety of the Civics syllabus, assesment methods only revolve on four types: test, worksheet, presentation, and announcement. As expected, tests are used when measuring the knowledge and understanding domain while the other three are used for the other domains. Announcement here means "recitation" where the students answers questions and share opinions. Tests and "announcements" dominate the Civics curriculum guide which confirms that Japanese Civics, and Social Studies in general, are evaluated in a very traditional manner. Nevertheless, it is impossible to com-ment on how appropriate or valid these are because the author did not provide detailed characteristicts or contents of these measurement methods.

Table 5. Assessment Standards for the First Unit of Civics (Modern Society) in Hiroshima University-Attached Junior High School (Tanahashi in Ikeno, 2011)

Unit	Objective	Content of Study	Standard for assessing student's performance	Viewpoint/ criteria for Assessment	Method for Assessing Student's Performance
Modern Society and Us	Interest in various events in modern society; understands the deelopment process and the transformation of modern Japan	Examine the structure and traits of modern society	Understand the structure and traits of modern society sufficiently	knowledge and understanding	Test
		Examine the history of society and its economy in Japan	Understand the transfor-mation of society and the development of economy in Japan	interest, motivation, and attitude/ skills and expression/ knowledge and understanding	Announcement (Recitation)
		Examine the develop-ment of science and technology	Recognize the development of technology	skills and expression	Worksheet
		Examine the transfor-mation from an industrialized society to an information-based society	Understand why the transformation occurred	thinking and judgment/ knowledge and understanding	Test

2. Kanagawa High School District

Kanagawa is a prefecture close to Tokyo and includes Yokohama, another major city in Japan. Its school district includes 143 high schools. In March, 2009, the prefecture's Board of Education released the "Guidebook on the Promotion of Citizenship Education" to guide schools and teachers on how to conduct citizenship education in the different school subjects. The practice of citizenship education in this region is unique in that it utilizes both standards framework by NIER and the three criteria described by METI in the Declaration on Citizenship Education as viewpoints for evaluating student learning. As such, it tries to promote a new form of education without by weaving it with the MEXT's guidelines. The four evaluation viewpoints of interest, thinking, skills, and knowledge in each subject are maintained, but opportunities that promote citizenship education are noted through the adoption of the viewpoints by specified in the Citizenship Education Declaration by METI. The adoption of the METI's viewpoints is based on the Board of Education's belief that the current globalization and knowledge-based society is redefining the concept of citizenship which calls for a new kind of understanding, abilities, and attitude. The Board of Education created outcomes using these two standards to develop sample lesson plans for all grade levels which teachers can use as reference.

Table 6: Assessment Standards for the Grade 9 Civics class in Kanagawa High School Disctict (Kanagawa Prefectural General Education Center, 2009)

Unit/Lesson Title	Unit goals	Evaluation Criteria (based on NIER)		Citizenship Education Viewpoints (based on METI's)		Methods of Measurement
Politics/ Local Autonomy "Establishing Ordinance to Improve the Area"	1. Understand the basic idea of local autonomy	Interest, motivation attitude	1. Expresses interests in the politics of prefectures and municipalities 2. Shows interests in problems of the locality	Consciousness Knowledge	Participation in society Political field (decentralization and participation by residents)	•Worksheets •Presentations •Debates
	2. Understand the political mechanisms of local public entities and be conscious of the rights and obligations of residents so that they can contribute to the develop-ment of local autonomy	Skills in utilizing documents Thinking Judgment Expression	3. Investigates and thinks about the problems and political issues affecting one's life 4. Collects and organizes data on the prefectural and municipal politics 5. Uses facts to make accurate judgment about the local issues 6. Listens to others' opinions before expressing judgment	Skills	(Collection and analysis of information) · grasps facts correctly through observation and investigation and organize them based on viewpoint · gathers necessary information and think persuasive explanation · analyzes data critically (Decision Making) · states one's opinion based on the data analyzed · Respects other's opinions and find point of agreeements	•Reports •Reflection
		Knowledge and under-standing	7. Understands the political mechanisms of prefectures and municipalities, the principle of local autonomy and the rights of residents			

Table 6 shows an outline of a lesson plan made for Third Year junior (Grade 9) high school students. It indicates clear and more specific criteria or indicators to achieve the unit goals. These criteria are adopted from and correspond to the four evaluation viewpoints set by the National Assessment Norms and Standards. Aside from Civics-specific learning outcomes, the table also contains the specific knowledge, skills, and attitude that demostrate citizenship. To measure these learning outcomes, more varied and less traditional assessment methods are used compared to those of Hiroshima Junior High School. In this particular unit lesson, the students civic consciousness are measured through answering worksheets which ask about which particular ordinances they think should be passed. Students skill in gathering data, thinking, judment, and expression are assessed through such formative exercises as debates and presentations of their proposed ordinances. As a summative assessment, the students are asked to write reports and reflection about their role as citizens. The Kanagawa School District considers this to be a better way to promote, engage, and assess a more active citizenship participation of students.

3. Shinagawa Ward School District

Shinagawa is a special ward or municipality in Tokyo Prefecture. Its Board of Education advocates for an educational theory that makes citizenship a core concept. Thus, in 2004, the Shinagawa Board of Education implemented a new subject called "Shimin-ka" or "Citizenship". This subject was created by integrating the three "non-subjects"—Moral Education, Special Activities, and Period of Integrated Studies—into one. Although MEXT specifies a uniform curriculum for all schools, Shinagawa Ward was given special permission to enact this new subject since it doesn't disrupt the implementation of the compulsory subjects. This, therefore, results into having two school subjects with citizenship development as their main objective: Social Studies and "Citizenship".

As a new integrated subject, "Citizenship" has its own goals, targets, and content different from the citizenship education classes carried out in other schools (See Table 7). This subject is taught to students from Grades 1 to 9. In junior high school, which covers Grade 8 to 9, the goals are: 1) to develop an interest in what is happening in the society, to improve the abilities to think and judge can lead to problem-solving and to develop and form an attitude that contributes to society through volunteer works and work experience programs; and 2) to hold one's future prospect in life and develop an appropriate view for work and one's career for self-realization (Shinagawa Board of Education in Cogan & Grossman, 2012). In Toda's analysis of the new subject (in Ikeno, 2011) he argued that "Shimin-ka" cannot be directly translated to English as "Citizenship", in the western sense of the word, as it lacks the application of principles of social science and social structure integrated into it. Fujiwara (2008) concurs with this observation and claims that *Shimin-ka* is a Japanese-style citizenship education that emphasizes a nationalistic, moral education.

Table 7. The Seven Internal Qualities to be Developed and Five Areas in the "Citizenship" Subject of Shinagawa School District (Toda in Ikeno, 2011)

Domain	Quality	Five Areas of the Subject	Objectives
Relationship of individual to himself	Independence	Self-control	Establish harmony between oneself and the environment; carry out duties and responsibilities; learn the skills required to manage their lives with independence and autonomy
	Assertiveness Adaptability	Autonomous Activities	Participate in based on their own will and intentions; learn the qualities and skills required to form a democratic nation
Relationship of individual to groups	Civic Virtues	Forming Human Relations	Deepen their self-understanding by respecting the individuality of others; build good relationships with different people; learn the skills required to live with various members of society
Relationship of individual to society	Logicality Competence	Future Planning	Understand economic and financial sytems in the modern world; develop awareness of the role one should play in society; establish goals for their career and future way of life; learn the skills required to paln their lives.
	Creativity	Cultural Creativity	Cultivate their interest and deepen their understanding of the traditional culture; participate in cultural events; gain a view of life based on the ancestors'; and develop universal cultural values

Assessment of learning is the last stage in the five-stage lesson development of the

citizenship course (Table 8). Unlike NIER's four evaluation viewpoints and METI's three, Shinagawa's Citizenship course only has two. These include: 1) knowledge and understanding and 2) skills, behavior, and attitude. Each school is given freedom to set the specific criteria for these viewpoints. Furthermore, schools and teachers are given a range of choices when in comes to evaluation methods to use (Table 9). This is another important characteristic that sets it apart from the evaluation practices done in other schools. The Board of Educatio recognizes that citizenship education is not an easy domain to measure and teachers may not be the only appropriate person to assess all citizenship learning. Hence, it attempts to provide a more holistic approach in assessing and evaluating the learning in the subject by including other evaluation approaches such as self-evaluation and peer assessment. This is done in the hope of developing the students' judgment skills and, more improtantly, encouraging them to become more active and responsible for their own learning. Parents have also been involved in the assessment to provide teachers more useful information about the students' learning. Moreover, this will push parents to become more involved with their child's education and help them monitor their child's efforts and progress over time. On the downside, this system might put more workload to teachers as they have to constantly communicate and brief students, parents, and other stakeholders with the assessment process, criteria and results.

Table 8. Shinagawa Ward's Citizenship Subject Lesson Development and Sample Lesson in Grades 8 & 9(Shinagawa Board of Education Citizenship Course Teaching Guide, 2011)

Lesson Development		Sample Lesson (Unit 4: Social Rules and Etiquettes)	
Stages	Main learning activities	Goal: Be able to properly behave and observe social rules and etiquettes	
Step 1: Task identification; discovery and grasping of problems	Reflect on oneself; notice, think, investigate, and discuss.	There are various rules and regulations in society. Think about why they are important.	
Step 2 Proper knowledge and recognitiof value and moral sentiments	Recognize facts and explore background and factors. Recognize proper judgment standards and values.	Understand one's own freedom and responsibilities, rights and obligations. Understand the importance of controlling one's own behavior.	
Step 3 Skills training and experiential activities	Foster actions, behavior, attitudes. Perform experiential activities and learn coping skills	Examine one's own manners. Examine rules that are relevant to our lives (Example: Shinagawa District Ordinance concerning prevention of throwing of empty cans, cigarette butts, and others)	
Step 4 Daily practice and utilization	Practice and utilize learning in schools, homes, and communities.	Practice and observe manners and rules in everyday life. Be an aware member of society so as not to trouble the people around around you.	
		Evaluation Viewpoints	
Step 5 Summary/ Evaluation	Improve one's way of thinking and actions. Use knowledge and skills in learning/life situations.	Knowledge and understanding	Did you understand the importance of manners and rules in building society?
		Skills, behavior, actions	Do you live according to good manners and social rules?

Table 9. Evaluation Methods of the Citizenship Course in Shinagawa Ward(Shinagawa Board of Education, 2011)

WHO	HOW
1. Self-evaluation by students	• Evaluation through observation of behavior - Relations/involvement in group settings - In special activities - Transformation of behavior in the medium to long term
2. Evaluation by teachers	• Evaluation by paper and interview - Answering written questions - Individual or group interview
3. Evaluation by fellow students	• Evaluation based on classroom output - Evaluation based on learning outputs - Descriptions of worksheets - Contents of learning summary
4. Evaluation by parents/guardians	• Evaluation by reflection and summary of one's activities - Evaluation based on the reflection papers and essay - Evaluation on daily practice - Self assessment against the set target

Recording and Reporting of Student Learning

Recording and reporting are integral part of the evaluation process (Pearce, et. al., 2015; Assessment in Alberta, 2007) . In Japan, all schools have to follow the method of recording and reporting student learning set by MEXT. Urabe (2006) noted that there are three documents used to record the achievement of students. The first one is the confidential report, which is called "*choshasho*" or "*naishinsho*" in Japanese. It is a document that contains a student's records of admission from junior school to senior high school and from senior high school to university. The second one is the student progress report card or "*tsushinbo*" which is used to communicate student performance to the family at the end of each school term. The third one is called the Cumulative Student Guidance Record or "*shidoyoroku*" (Table 10). This is the most important one because it is the official record summarizing a student's achievement in school. It serves as "the ledger used for future guidance and providing evidence for external bodies" (Tanaka, et.al., 2017). In other words, whatever written in the cumulative guidance record is used as a basis for admission to a new school or university in addition to the required entrance examinations. It is kept confidential from the students and parents and contains the real record of student performance. According to Ishida (in Urabe, 2006), the details written on the Cumulative Guidance Record can be different from the

facts written on the school report card, particularly on non-academic assessments or behaviors. This is called the 'double document structure' of recording assessments in Japan (Ishida in Urabe, 2006). It is said that teachers disregard reliability and objectivity on the school report card by putting more encouraging results and observations (Urabe, 2006).

The grading system in junior high schools in Japan uses a three-letter rating scale to assess each of the viewpoints in the major subjects. To summarize the rating for each subject, a five-tiered numerical scale is used (Table 11). Among the citizenship education subjects, only Social Studies uses the letter and numerical ratings. In the Special Activities subject, the criteria are indicated and teachers would have to write specific activities or description of each. If the students have satisfactorily achieved the expectations of the subject, a circle is drawn corresponding to the content or viewpoint. For the Integrated Period of Study, written descriptions regarding the student's participation in the activities in the subject are provided as evaluation. While there are no unified and explicit assessment for moral education, behavioral aspects and traits are listed to which circles are drawn next to the item to indicate that it was observed in the student. Lastly, in the "General Findings" teachers describe in writing how students behave at school, their personal characteristics and abilities as well as their voluntary activities and other achievements outside the school. Encouraging commendations and observations also appear in the school report card. In Shinagawa Ward, where a special citizenship subject is taught, the grading for the Social Studies and the behavioral record are retained. The written assessments for Special Activities and Period of Integrated Studies go to the space alloted for assessing Shimin-ka or "Citizenship".

Table 10. An Example of Student Cumulative Guidance Record in Junior High School Student

Name of Student	Name of School	Year Level	1	2	3

I. Learning Record in each Subject					II. Rating					
Subject	Viewpoint / Year	1	2	3	Year	Japanese	Social Studies		Math	Science
Japanese	Interest, motivation, and attitude;				1		5			
	Thinking and judgment				2					
	Skills and expression				3					
	Knowledge and understanding.									
Social Studies	Interest, motivation, and attitude;	A			Year	Home Economics	Music	Art	P.E & Health	Foreign Language
	Thinking and judgment	A			1					
	Skills and expression	A			2					
	Knowledge and understanding.	B			3					
Math	Interest, motivation, and attitude;				Special Activities					
	Thinking and judgment				Content	Viewpoint	Year	1	2	3
	Skills and expression				Classroom Activities	*Establishing desirable relationships*		○		
	Knowledge and understanding.				Student Coun-cil Activities	*Establish discipline of school life*		○		
Science	Interest, motivation, and attitude;				School Activities	*Awareness of one's role and contribution to the group*		○		
	Thinking and judgment									
	Skills and expression									
	Knowledge and understanding.									
Music	Interest, motivation, and attitude;				Period of Integrated Studies					
	Thinking and judgment				Year	Viewpoint/Acitvity		Evaluation		
	Skills and expression				1	*Participate in town planning, investigation of local workplaces/ability to collect information and use information, ability to*		*He was active as a leader in program. In the workplace tour, he made interviews and*		
	Knowledge and understanding.									
Art	Interest, motivation, and attitude									
	Thinking and judgment									

	Skills and expression					*set issues and pursue issues*	*summarized the important learnings.*
	Knowledge and understanding.						
Health and P.E.	Interest, motivation, and attitude				2		
	Thinking and judgment						
	Skills and expression						
	Knowledge and understanding.						
Technology And Home Economics	Interest, motivation, and attitude;						
	Thinking and judgment						
	Skills and expression				3		
	Knowledge and understanding.						
Foreign Language	Interest, motivation, and attitude;						
	Thinking and judgment						
	Skills and expression						
	Knowledge and understanding.						

Table 11. Grading Scale Uses in Student Evaluation in the Junior High Schools (Ito, 2006)

Letter scale used to assess the viewpoints	Combination of the letter scale to determine the numerical (general rating) in the subject
A – satisfactory B – almost satisfactory C – needs effort	AAAA, AAAB → "5" high level of very satisfactory achievement AAAC, AABB → "4" very satisfactory ABBB, BBBB, BBBC → "3" almost satisfactory BBCC, ACCC → "2" needs. effort BCCC, CCCC → "1" needs special effort

Conclusion

The Japanese educational system provides students numerous opportunities to cultivate citizenship. A clear evidence of this is the variety of subjects in the curriculum that consider the development of citizenship qualities as their main goal. This variety, however, has a downside since it makes the assessment and evaluation of learning in citizenship education more difficult. This problem is further complicated by the different conceptions and theories of citizenship that are being promoted in Japanese schools. While others promote a morally inclined citizenship that emphasizes social participation for common interest, others underline the active exercise of individual rights. Furthermore, due to globalization, the traditional, inward, nation-centered notion of citizenship is being challenged by the idea of a more outward, global, and multicultural citizenship. This variety in conceptions of citizenship, therefore, results to a lack of unified or coherent set of objectives, standards, and learning outcomes that would guide the practice of assessment and evaluation of citizenship learning.

Most schools follow the National Assessment Norms and Standards. Critics, however, think that indicators for citizenship education in this outcomes framework are narrowly reflected in the discipline of Social Studies. As a result, the evaluation methods are limited, traditional, and doesn't promote active citizenship. Thus other frameworks for citizenship education were created, specifying indicators and reflecting their concept of

citizenship. One school district, Shinagawa Ward, even went beyond this and created a separate citizenship class in order to provide what they think is a more holistic way of teaching and evaluating citizenship. These different practices, therefore, is a clear challenge to the Japanese education system to clarify its conception and theory of citizenship so that its teaching, learning, and evaluation would not go in different directions. Moreover, it starts a discussion on whether the structure of citizenship education should remain cross-curricular, an integrated, or a separate/stand-alone subject. Finally, these considerations would, of course, have a direct impact on what kind of learning outcomes, measurement instruments, assessment tasks and reporting system will be used so that the evaluation of learning in citizenship will be more appropriate, authentic and holistic.

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Metaphorical Images of Pre-service Teachers in "Nasreddin Hodja-Child-Anecdote" Triad

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Introduction

It is widely known that every nation has rich cultural resources both written and oral forms and those who live in this society feed themselves by these literary sources via their symbolic popular heroes as Nasreddin Hodja is. He lived during the reign of Alaaddin Keykubat of Anatolian Seljukian (1208-1284). It is said that Nasreddin Hodja is the only one humour genious Turkish folk created (Güleç, 2005). Nasreddin Hodja, who is famous for his anecdotes and humours, is one of the most powerful figures in Anatolian culture and history (Boratav, 2006). His anecdodes have spread over from Middle Asian to Near Eastern and from Balkanian to Chineese lands (Kişibekov and Kişibekov, 2005). The main charecteristics of Hodja's anecdotes is to be contradiction to the conditions of the people before him. In addition, the core themes of his anecdotes focused mostly on love, kidding, mockery and appraisal. His tales are so invariably marked by a rich, distinctive humour that anybody takes some lessons by the realization of his own flaws, often through self-mockery. What distinguishes Hodja's tales and anecdotes is of course the humour he used skillfully, which can be invaluable educational tool for people (Tor, 1986).

Not only are Nasreddin Hodja's anecdotes used as educational tools but also, they function as a vehicle to pass socio-cultural values from one generation to other. Nasreddin Hodja's fame and popularity arise from hundreds of anecdotes originated from the folk with whom he lived, in which he melt humour and irony together in the same pot and literally serviced people as a pot of cold water (Kişibekov & Kişibekov, 2005). While doing these, Hodja can sometimes be seen to play a contradictory role of literate, illiterate, greedy, easy-going, conscience prof, timid, reckless, silly, synical, coward, and daring. It is also very common to witness any situation to be exemplified by Nasreddin Hodja's anecdotes or humours both in the classrooms while the teachers manipulating their subjects and in the meetings in social cultural lives of Albenean, Serbian, Bosnian and Turkish people (Recepoğlu, 2005). In this way, Turkish people can be said to apply for Hodja's anecdotes and humours frequently as educational tools to balance their socio-cultural lives and train their society like a social trainer (Güleç, 2005). It is also seen that children are also special thematic group in his anecdotes (Anovska, 2005). Hodja's anecdotes are very important in that they contribute children's social, cognitive, personal development as they have educational value (Ateş, 2005; Yakıt, 2005). Now that Nasreddin Hodja appears to be so many different characters in his anecdotes and lives in many houses and in many events of Turkish people social

lives that it is worth studying this eminent figure of Anatolia and his anecdotes from prospective teachers' metaphoric perspectives.

It has been possible to see many researches about use of metaphors both in social and educational sciences since1980's (Casebeer, 2015; Kucuk & Yalcin, 2014; Kabadayı, 2012; Alger, 2009: Yıldırım, Ünal ve Çelik, 2009; Cerit, 2008; Saban, 2008; Kabadayı, 2008; Yob, 2003; Saban, Koçbeker ve Saban, 2006; Ocak ve Gündüz, 2006; Cerit 2006). But, there is some limited research on Nasreddion Hodja as a great humourist living in many cultures with different name and his anecdotes (Kabak, 2012; Lytra, 2011; Aşılıoğlu, 2008; Kabadayı, 2005; Çevirme, 2004). Lakeoff & Johnson (1980) pointed out the fundamental importance of metaphor as a basis for everyday cognition. In line with their explanation, Bowers (1993) also puts forward that all human thinking is both cultural and metaphorical at the core. The essence of metaphorical thinking is to comprehend a new concept or occurrence by relating it to something else. Furthermore, it is explained that people tend to understand their world through metaphors, which relate complex phenomena to something previously experienced (Buaraphan, 2012). In addition to this, Johnson (1987) describes that metaphors are primary means by which we construct or constitute order and not mere passive receptacles into which experience is poured. It can be inferred that metaphors can be constructed to link our bodily experience of something to our more abstract thinking, and to "give shape, structure, and meaning to our imagination" (Sfard, 1994, p.47). In short, metaphors are something that constructed by our minds that help us to present something in terms of something else. Turkish culture is also rich with colorful and interesting metaphors of teaching in which we determine how we interpret reality and experience. Identifying our own metaphors allows us to reflect on the way we define our role and purpose in the life (Bowman, 1998-1999).

The aim of this study was to discover and explain metaphorical images of pre-service preschool teachers enrolled in preschools teaching department on "*Nasreddin Hodja – Anecdotes – Child*" chain via their self-generated metaphors. To guide this study, the following research question was investigated:

What is "Nasreddin Hodja – Anecdotes – Child" like? In addition to this, the participants were required to write as following formatte:

"Nasreddin Hodja – Anecdotes – Child" is like…… because,,,,,,,,,,,,,,,,,

Participants

In this study qualitative research model used to collect the study data from the participants involved the research pointed out as the concepts like metaphor and imitation in Turkish has become one of the most important data collection methods in

qualitative researches (Güven & Belet, 2010; Aydın ve Pehlivan, 2010; Boyacı, 2009). For this reason, several scholars have recommended the use of metaphor analysis as a research tool (Armstrong, 2008; de Guerrero & Villamil, 2002). Metaphor analysis is an analytical approach that examines linguistic metaphors and then categorizes these metaphors interms of conceptual metaphors in order to provide some insight into participants' thought patterns and understandings of a given topic.

For the present study in which qualitative research method was adopted, the participants were selected through criterion sampling method out of purposeful sampling methods. The data was collected from 43 participants involving the study. They were all preservice preschool teachers attending the A. K. Faculty of Education of Necmettin Erbakan University with a population of 11.000 students. About % 10 (4) of the participants were male % 90 (39) of them female. The proportion of the male and female choosing the preschool teaching profession is more or less the same in the researchs carried out in the world (Hmelak & Lepicnik Vodopivec, 2012). The participants' age mean was 21.5.

The analysis of the metaphors generated by the participants was attained in four stages: (1) Sample metaphor image phase (2) Coding and sorting out phase (3) Developing category phase (4) Ensuring relaibility and validity phase

Sample Metaphor Image Phase

Metaphor was introduced to the class as a tool to asisst them to think about what it is to be a "Nasreddin Hodja – Anecdotes – Child" like. To illustrate the ways in which metaphor and its analysis might lead to insights into their understanding of "Nasreddin Hodja – Anecdotes – Child" chain, a sample metaphor was presented including: Nasreddin Hodja as Psycholog, Child as Patient and his Anecdote as Therapy. To illustrate the way in which metaphor might inform personal analysis of ideas about "Nasreddin Hodja – Anecdotes – Child", I outlined the situation to reveal aspects of how I viewed "Nasreddin Hodja – Anecdotes – Child" chain: "*Nasreddin Hodja is a psycholog, child is a patient. Because, Nasreddin Hodja makes the children laugh by his humour just as the psycholog heals the patient who is pschologically in bad condition by his theraphy*." After examplfying the situation the participants were invited to construct their metaphors about "Nasreddin Hodja – Anecdotes – Child" chain and to explain relevant attributes of them in written format on the sheet of paper on which *"Nasreddin Hodja – Anecdotes – Child" is like …… because…..".* was printed beforehand. The participants were not limited to write a few numbers of metaphors in question above. They could write more than one metaphore if they wished. The participants completed the blanks by fixing appropriate metaphors from their lenses on the papers they were handed out beforehand.

Coding and Sorting out Phase

The responses of the participants checked and tested on basis of content analysis of the qualitative research method. The metaphores they generated were analyzed and sorted out. The metaphors which did not meet the metaphor generated criteria or those having the missing part of the metaphore chain in question on the basis of "Nasreddin Hodja – Anecdotes – Child" chain were excluded from the list. 57 metaphor chains were generated during the generation process. 8 of them were excluded from the list as they did not meet the research criteria determined mentioned above for instance, *Hodja-Neighbor-Donkey* does not meet the criteria chain as the "Donkey" leg of the process failed.

Developing Category Phase

In the analytical process, some themes and some sub-themes were formed and the appropriately generated metaphores were included in the study sycrutunized according to the themes and sub-themes. According to the content analysis of the study 8 themes are constructed, which are; *healer*, *teacher, judge, entertainer, punisher, advisor,* and *magician, persuader.* 49 sub-themes are formed and classified under the main themes mentioned above.

Relaibility

It is important to put forward the detailed report of the information and how the researchers obtained the presented results fort he validity and relaibility of the data (Yıldırım & Şimsek, 2006). Some experts were asked to rate the metaphors whether they represented the relavant category since the information was handled via the responses of pre-service teachers to the semi-structured questions. The experts were required to write the metaphors in the related category and then the groups created by the expert and the outcomes of the experts were compared. To ensure the reliability of the study, the papers were examined by 4 field experts including the researcher him/herself, and then the agreement and disagreement items were determined. The formula suggested by Miles and Huberman (1994, p. 64) was practiced to provide the reliability of the study, which is P (Percentage of divergence) = (Na (Number of agreement) / Na (Number of Agreement) +Nd (Number of Disagreement)) x100. As a result of the application the rule, 49 / (49 + 4) x 100 = % 92 was found, which provides the reliability in line with the studies carried out by the researchers (Eren, Çelik, & Aktürk, 2013; Güven & Belet, 2010; Boyacı, 2009).

Discussion

In this part, all metaphores generated by the participants were collected and reviewed

and analyzed in respect of content analysis one by one. Although there is no clear-cut classification between some metaphors they are categorized under themes as the sub-themes. These themes and sub-themes are examined detailly in the tables as follows;

Table 1. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "HEALER"

Themes	Sex	Sub-Themes	*f*	Significant Metaphor Sample
HEALER	M F 3 22	Doctor-Patient-Medicine (6), Operator-Wounded-Operation (5), Pharmatics-Patient-Medicine (4), Healer-Helpless-Cure (4), Dentist-Patient-Treatment (3) Medicine man-Hopeless-Remedy (3).	*6*	**Doctor-Patient-Medicine**: Nasreddin Hodja is a doctor, child is a patient. Because, Nasreddin Hodja makes the children recover by his anecdotes just as the doctor heals the patient by his medicine.

In the table 1. 25 participants of whom 3 are male and 22 are female generated 6 metaphors. % 12 of the metaphores generated are under the theme of "Healer". These are Doctor-Patient-Medicine (5), Operator-Wounded-Operation (4), Pharmatics-Patient-Medicine (4), Healer-Helpless-Cure (3), Dentist-Patient-Treatment (3) Medicine man- Hopeless-Remedy (2). In these sub-themes Nasreddin Hodja is metaphorized as the "*Healer*" who saves the hopeless people from their disasters. While metaphorizing, the participants mostly used the medical terms to resemble Hodja and his anecdotes. In these metaphors, Hodja mostly functions as a remedy man and his anecdotes as remedy to the hopeless people who are always in search for remedy for their disasters. The participant K explains "*Operator-Wounded-Operation*: *Nasreddin Hodja is an operator and a child is the wounded. Nasreddin Hodja heals the wounded and makes their pains forget by his humour and jokes just as an operator operates, serves a remedy and disinfects the wounds of the wounded and saves their lives by operation."* In addition to this, the participant E looks the metaphor chain from different lenses as follows "*Pharmatics-Patient-Medicine: Nasreddin Hodja is a pharmasist, child is a patient and Hodja's humour is a medicine for them. The children need Hodja's witt and go to to get his advise to solve a complex problem similarly, a patient goes to the pharmacist's to buy the medicine to recover from the illness."*

Table 2. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "TEACHER"

Themes	Sex	Sub-Themes	*f*	Significant Metaphor Sample
TEACHER	**M F** 3 21	Humourist-Child-Humour (4), Taleteller-Children-Lessons learned (4), Professor-Student-Lesson (3), Coach- Basketballer-Tactics (3), Master -Apprentice-Technique (3), Spherd-Herds-Posture (3), Technical Director-Footballer-Tactics (2), Bird lover-Bird-Fredoom (2).	***8***	***Tale-teller-Child-Lessons learned:*** Nasreddin Hodja is like a tale-teller because, children could listen to his humour with pleasure just as they could usually enjoy fairy tales which involve surrealistic events without getting fed up with listening to Hodja and learn lessons related to life.

In the table 2. 24 participants of whom 3 are male and 21 are female generated 8

metaphors. % 16,3 of the metaphores produced are under the theme of "Teacher". These are Humourist-Child-Humour (4), Taleteller-Children-Lessons learned (4), Professor-Student-Lesson (3), Coach- Basketballer-Tactics (3), Master -Apprentice-Technique (3), Spherd-Herds-Posture (3), Technical Director-Footballer-Tactics (2), Bird lover-Bird-Fredoom (2). In this metaphores, Nasreddin Hodja functions as a literate and knowledgable man who always sheds light on the illiterate and the dark corners. The participant D explains "*Coach-Player-Tactic: Nasreddin Hodja is like coach and children are the basketball players who need some technique and tactics to win the game. Nasreddin Hodja gives the children some tactics by the way of his humour to get out of the hard combat.*" In the other example of the metaphor the participant C metaphorizes Hodja as bird-lover as follows: "*Bird trainer-Bird-Freedom: Nasreddin Hodja is a bird trainer, child is a bird and Hodja's humour is freedom for them. Hodja opens new horizons for children to surf and to have new tastes just as a bird trainer cares, feeds and teaches new tricks to the pigions and then releases the pigions out of their cages.*" This metaphore is in line with the metaphor of a well-known philosoph Gazali who describes the child rearing which is quite meaningfull to us "*Child is resembled to a bird in your hands. If you tighten your hands the child feels breathless and may die, if you wide-open your hands it may fly away outof your hands this time. To keep it alive you have to keep your hand half released*"

Table 3. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "ENTERTAINER"

Themes	Sex		Sub-Themes	*f*	Significant Metaphor Sample
	M	**F**			
ENTERTAINER	2	16	Animator-Guest-Animation (3), Clown-Audience-Demonstration (3), Comedian-Spectators-Laughter (3), Caricaturist-Readers-Cartoon (3), Musician-Audience-Ceremony (2), Illusionist-Greedy-Illusion (2), Footballer-Spectators-Hat trick (2)	*8*	***Comedian-Spectators-Laughter***: Nasreddin Hodja is a comedian who has role of teacher teaching while entertaining a child and audience is the child just as comedian wears various masks to entertain a child who needs life lessons by having great joy and laughter.

In the table 3, 18 participants of whom 2 are male and 16 are female generated 8 metaphors. % 16.3 of the metaphores generated are under the theme of "*Entertainer*". These are Animator-Guest-Animation (3), Clown-Audience-Demonstration (3), Comedian-Spectators-Laughter (3), Caricaturist-Readers-Cartoon (3), Musician-Audience-Ceremony (2), Illusionist-Greedy-Illusion (2), and Footballer-Spectators-Hat trick (2). The common points of the metaphores generated are that Nasreddin Hodja is man of comedy and entartains people who are in distressed. The anecdotes of Nasreddin Hodja are so multi-sided that they both make people laugh, entertain and think (Güleç, 2005). The participants J looks the phenomene from hotel guest as follows: *Animator-Guest-Animation: Nasreddin Hodja, as a great humourist, entertains the children by his*

logical jokes similarly, he is like an animator who animates and entertains the the hotel guests by his demonstration and animation activities". While the other participant K explains the situation as "*Clown-Audience-Demonstration: Nasreddin Hodja is a clown who entertains people by making them laugh and audience is a child who needs joy and laugh by his stage performance and demonstration*." Following the principle of " *one laughter is worth a kilo of chop meat"* the participant T explains "*Comedian-Spectators-Laughter: Nasreddin Hodja is a comedian who has role of entertainer who is entertaining a child and audience is the child just as comedian wears various masks to entertains a child who needs life lessons by having great joy and laughter."*

Table 4. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "ADVISOR"

Themes	Sex		Sub-Themes	*f*	Significant Metaphor Sample
	M	**F**			
ADVISOR	1	14	Guide-Tourist-Journey (4), Prophet-Sinful-Paradise (3), Ombudsman-Statesman-Solution (3), Robin Hood-Hopeless-Help (2), Leader-Lost-Route (2), Father-Son/Girl-Advice (1).	***6***	***Guide-Tourist-Journey**:* Nasreddin Hodja is a guide and a child is a tourist who does not know where to go, how to go and one who needs sightseeing and tries to learn new information about the places they visit. Nasreddin Hodja opens new horizons for the children who are in need of learning new knowledge about the life by his jokes just as the guide give information about the hidden historical and the social lives of the places the guide guides the tourist and illuminates them.

In the table 4. 15 participants of whom 1 is male and 14 are female generated 6 metaphors. % 12.3 of the metaphores generated are under the theme of "*Advisor"*. The sub-themes included are Guide-Tourist-Journey (4), Prophet-Sinful-Paradise (3), Ombudsman-Statesman-Solution (3), Robin Hood-Hopeless-Help (2), Leader-Lost-Route (2), and Father-Son/Girl-Advice (1). Under this theme, Nasreddin Hodja functions as an information stocker and knowledge transmitter. Nasreddin Hodja observes human behaviours, examines and finds solutions by the methods special to him (Güleç, 2005). Anyone who needs advice, route, solution and shortcut to cover the long distance come to hodja and advice as a result s/he is satisfied with the knowledge they transmitted. Once, in one his anecdotes, Hodja solved the conflict among the children by saying that "*Who pays the pipper calls the tune*." In line with this saying, the participant U points out "*Ombudsman-Stateman-Solution: Nasreddin Hodja is a ombudsman who could brings practical solutions for the problems of the children who are like the statesmen wha are drowned in the problems. Nasreddin Hodja gives them advice and the effective ways to get out the crises by his humours."* The participant J likens Hodja to Prophet who shows the true road and route to the sinfull who are in deadlock: "*Prophet-Sinful-Prayer: Nasreddin Hodja is a prophet, child is a sinful and Hodja's humour is a prayer for them. Hodja gives advice and teach new ways to the children to get out of hard situation just as the prophet saves the sinfuls' soul by prayer."*

Table 5. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor under the Theme of "NAVIGATOR"

Themes	Sex		Sub-Themes	*F*	Significant Metaphor Sample
	M	**F**			
NAVIGATOR	2	16	Discoverer-Adventurer-Dicovery (3), Pilot- Passanger-Route (2), Driver-Passenger-Destination (2), Inventor- Folk-Invention (2), Wind-Sailboat – Sea (2),. Captain-Ship-Route (2)	***6***	***Discoverer-Adventurer-Dicovery:*** Nasreddin Hodja is a discoverer discovered the secrets of the life for his life long and children are like the adventurers who are willing to visit and looking for the best way to go to the unknown continent. Nasreddin Hodja tells them the right route to find their ways to reach the desired place in short cut by his humour. Thanks to Hodja, the children could travel and visit the unknown continent and learn new thing related to life virtually.

In the table 4. 18 participants of whom 2 are male and 16 are female generated 6 metaphors. % 12.3 of the metaphores generated are under the theme of "*Navigator*". Under this theme, Discoverer-Adventurer-Dicovery (3), Pilot- Passanger- Route (2), Driver-Passenger-Destination (2), Inventor- Folk-Invention (2), Wind-Sailboat – Sea (2),. Captain-Ship-Route (2) sub-themes can be displayed. In this theme, Nasreddin Hodja is likened to a nevigator tool which always shows the very true route for the lost to find their ways. Child in this chain is metaphorized to the one who got lost in the chaos of the worlds of plays. Hodja's wisdom and wiliness are used to illuminate their path like a torch and shed light for those who got into dead-end street (Recepoğlu, 2005). The participant S explains: "*Captain-Vessel-Route: Nasreddin Hodja is a captain who is the only one who knows the right route and children are like vessels that lost their ways and roaming aimlessly on the sea. Nasreddin Hodja tells them the right route to find their ways on the sea by his humour."* One of his anecdotes, Hodja also shows the way to the children who want to send up him as follows: The spoiled children of the village wanted to make fun of Hodja who was passing nearby them while they were playing on the bank of the river.

They put their feet in the river and said "Dear Hodja, our legs got into knots and could not find our feet. Could you help us to find them?"

Hodja said "Okey!" and he grabed a long and thick stick and began to hit their legs with it randomly. When the children pulled their feet hurt by the stick Hodja laughed and said "Is it O.K.? Have just found your feet?"

Table 6. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "JUDGE"

Themes	Sex		Sub-Themes	*f*	Significant Metaphor Sample
	M	**F**			
JUDGE	2	16	Judge-Culprit-Acquittal (3), Lawyer-Accused- Case (3), Guardian-Prisoner-Punishment (2), Refree-Footballer-Punishment (2), Commander–Soldier–Punishment (3), Employer – Employee–Dismissal (2)	***6***	***Judge- Culprit- Acquittal***: Judge-Acussed-Acquittal: Nasreddin Hodja is a judge and a child is a accused who has committed any crime. Nasreddin Hodja solves a complex problem among children by his witt and humour and the children feel comfortable by a practical solution just as the judge judges the condition of the accused and acquits them consequently. The accused is acquitted from their so-called crimes by the decision of the judge and feel very happy**.**

In the table 6, 18 participants of whom 2 are male and 16 are female generated 6 metaphors. % 12.3 of the metaphores generated are under the theme of "*Judge*". Under the theme "Judge" Judge-Culprit-Acquittal (3), Lawyer- Accused- Case (3), Guardian-Prisoner-Punishment (2), Refree-Footballer-Punishment (2), Commander–Soldier–Punishment (3), Employer – Employee–Dismissal (2) are classified as sub-themes. In the most of his anecdotes, Hodja function as Kadi, the man of law, who always judges the situation by his practical witt and shows the solution in the shortest way. In his anecdotes, Hodja sometimes functions as a punisher who punishes the child beforehand as a preventive measure for him not to break the pot while bringing back after having filled with water from the fountain.

Table 7. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "PERSUADER"

Themes	Sex		Sub-Themes	*f*	Significant Metaphor Sample
	M	**F**			
PERSUADER	1	8	Politician – Folk – Persuasion (3), Tradesman-Clint-Trade (3). Manager – Employee – Excuse (2) Husband – Wife - Flowers (1)	***4***	***Politician-Folk-Persuasion***: Nasreddin Hodja is a politician and a child is one of the the members of the folk. Nasreddin Hodja persuades the child the by logical deduction and induction methods similarly, politician persuades the poor who want to what they desire easily by giving them believable promises, which are sometimes hard to be realized.

In the table 7, 9 participants of whom 1 is male and 8 are female generated 4 metaphors. % 8.2 of the metaphores generated are under the theme of "*Persuader*". Four sub-themes are categorized under this theme as Politician – Folk –Persuasion (3), Tradesman-Clint-Trade (3). Manager – Employee – Excuse (2), Husband – Wife - Flowers (1). The participants liken Hodja as a man of persuader who makes them believe or people had to believe against the logical ways Hodja found. It is the charecteristics of Hodja that he gives surprising answer when one tries to make fun of him in his anecdotes. He considers

word plays in his anecdotes. Hodja makes his humours by benefitting from word plays and simily (Güleç, 2005). In one of his anecdotes "*Children get hodja's turban and play among them as a ball. Hodja lets the children play his turban. One of the man asks where his turban is.* Hodja answers "*My turban wants to be child*".

Table 8. Subthemes of "Nasreddin Hodja-Child-Anecdotes" Metaphor Under the Theme of "MAGICIAN"

Themes	Sex		Sub-Themes	*F*	Significant Metaphor Sample
	M	**F**			
MAGICIAN	1	7	Medium- Poor-Treasure (3), Fortune teller- Unlucky-Augury (2), Soothsayer-Human- Soothsaying (2)	***3***	***Medium- Poor-Treasure***: Nasreddin Hodja is a medium and a child is a poor who is striving of life lessons literally. Nasreddin Hodja shows the child the only way of happiness in the life similarly, medium tells the exact place of the treasure to the poor who is striving to death.

In the table 8, 8 participants of whom 1 is male and 7 are female generated 3 metaphors. % 6.1 of the metaphores generated are under the theme of "*Magician*". Under this theme, Medium- Poor-Treasure (3), Fortune teller- Unlucky- Augury (2), Soothsayer-Human- Soothsaying (2) are formed as sub-themes. The participants metaphorize Hodja as magician who has extraordinary solutions to the matter and as a figure who has super natural powers among the adults and children. In line with the metaphor chain Medium- Poor-Treasure, in one of his anecdotes Hodja mediates the children face to face to the life experience as follows; "*One of the children comes to hodja and tells him s/he wants to learn the alphabet to be literate. Hodja accepts his demand and wants the child to climb up the tree as far as possible and tells him to release his hands and the child does and falls down and he cries as aaaaaah! in a grief. Hoca tells him to come tomorrow to introduce the second letter of the alphabet to him*." Literally, Nasreddin Hodja functions as the medium of experience to the child who wants to learn the alphabet by offering the child first hand-on experience as Hodja always gives a great value to "experience" in his life (Güleç, 2005).

Conclusion

In this study, the participants were required to generate metaphors by making relations among "*Nasreddin Hodja-Child-Anecdote*" triple chain. The participants made some reasonable relations and produced some metaphors from their lenses by following the procedure in question. The metaphors produced by the participants were evaluated placed in the themes and sub-themes determined beforehand. According to the content analysis of the study 8 themes are constructed, which are; *healer*, *teacher, judge, entertainer, punisher, advisor,* and *magician, persuader.* 49 sub-themes are formed and classified under the main themes mentioned above. The distribution of the themes and sub-themes as follows: 6 metaphors. % 12 of the metaphores generated are under the theme of "Healer". These are Doctor-Patient-Medicine (5), Operator-Wounded-

Operation (4), Pharmatics-Patient-Medicine (4), Healer-Helpless-Cure (3), and Dentist-Patient-Treatment (3) Medicine man- Hopeless-Remedy (2).

8 (% 16,3) of the metaphores produced are under the theme of "*Teacher*". These are Humourist-Child-Humour (4), Taleteller-Children-Lessons learned (4), Professor-Student-Lesson (3), Coach- Basketballer-Tactics (3), Master -Apprentice-Technique (3), Spherd-Herds-Posture (3), Technical Director-Footballer-Tactics (2), Bird lover-Bird-Fredoom (2).

8 (% 16,3) of the metaphors generated are under the theme of "*Entertainer*". These are Animator-Guest-Animation (3), Clown-Audience-Demonstration (3), Comedian-Spectators-Laughter (3), Caricaturist-Readers-Cartoon (3), Musician-Audience-Ceremony (2), Illusionist-Greedy-Illusion (2), and Footballer-Spectators-Hat trick (2).

6 (% 12. 3) of the metaphors generated are under the theme of "*Advisor*". The sub-themes included are Guide-Tourist-Journey (4), Prophet-Sinful-Paradise (3), Ombudsman-Statesman-Solution (3), Robin Hood-Hopeless-Help (2), Leader-Lost-Route (2), and Father-Son/Girl-Advice (1).

6 (% 12. 3) of the metaphors generated are under the theme of "*Navigator*". Under this theme, Discoverer-Adventurer-Dicovery (3), Pilot- Passanger- Route (2), Driver-Passenger-Destination (2), Inventor- Folk-Invention (2), Wind-Sailboat – Sea (2),. Captain-Ship-Route (2) sub-themes can be displayed.

4 (% 8.2) of the metaphors generated are under the theme of "*Persuader*". Four sub-themes are categorized under this theme as Politician – Folk –Persuasion (3), Tradesman-Clint-Trade (3), Manager – Employee – Excuse (2) Husband – Wife - Flowers (1).

3 (% 6. 1) of the metaphores generated are under the theme of "*Magician"*. Under this theme, Medium- Poor-Treasure (3), Fortune teller- Unlucky- Augury (2), Soothsayer-Human- Soothsaying (2) are formed as sub-themes.

In these metaphors it is revealed that Nasreddin Hodja sometimes takes a role of *healer* relieving people from their problems, *teacher* giving ironic lessons, and *judge* solving the disputes among the people, sometimes behaves as an *entertainer* making people think while making them laugh, *punisher* punishing the greedy severely, *advisor* giving logical solution to the matter in deadlock, and *magician* having supernatural power etc.

Regarding preschool teachers' metaphorical images "*Nasreddin Hodja-Child-Anecdote*" triple chain, a multitude questions warrant further research by using qualitative and quantitative research methods, for example: What are the pedagogical implications of Nasreddin Hodja's anecdotes about children? What are the contributions of Nasreddin Hodja's anecdotes to the multiple intelligences of children? How can very simplified

forms of Nasreddin Hodja's anecdotes illustrated be used as teaching materials in preschool settings? What are the similarities and differences between the teaching methods in action and the teaching methods Nasreddin Hodja used? There is generally much to learn about ralations and contributions of Nasreddin Hodja's anecdotes to children as a socio-cultural agent.

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Strengthening Inferences in Quantitative Education Studies Conducted by Novice Researchers: Capitalizing on Standards for Sampling, Research Design, and Instrumentation

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Introduction

The goal of many quantitative education studies is to produce valid and replicable findings that add to our knowledge and understanding in ways that improve subjects' outcomes, for example, identifying the most effective way to teach number ratios (e.g., $\frac{3}{7}$) to increase student learning in middle school mathematics classes. All methodological components of a study are important, but we focus on sampling, research design, and instrumentation because of their central role in the validity and replicability of study findings (internal and external validity), because recommended standards for these components do not appear to have received the attention they deserve, and because researchers may find these particularly challenging. In addition, the data analysis component is a broad field that requires many articles to cover the recommended standards.

In planning a study, researchers can turn to several resources offering guidance in the form of recommended methodological standards such as the Social Science Research website (http://www.socialresearchmethods.net/kb/), the American Psychological Association (APA) Publications and Communications Board Working Group on Journal Article Reporting Standards (2008), and What Works Clearinghouse [WWC] (2017). Research methodology texts (e.g., Pedhazur & Schmelkin, 1991), as well as summaries of research methodologies (U.S. Department of Education, 2013; Ellis & Levy, 2009, 2010), also offer useful resources. These resources provide information for capitalizing on these standards in planning and executing a study that enhances the likelihood of valid and replicable study-based inferences. However, these standards presuppose a level of expertise and experience that may not be present among novice researchers such as new faculty, individuals beginning non-faculty roles such as a working in a university-affiliated research center or a government-funded education center, faculty transitioning to more research-oriented work, and students conducting their own research.

The goal of this paper is to encourage novice researchers in the educational sciences to capitalize on methodological standards and to respond to methodological challenges that can undermine these standards in ways that help preserve the validity and replicability of study-based inferences. We begin by reviewing recommended methodological

standards for sampling, research design, and instrumentation and provide examples of common methodological challenges and advice on how to respond. We also review a sample of quantitative studies to assess the extent to which the standards have been employed.

Review of Methodological Standards

We assume a study's rationale, literature review, and research questions appropriately inform the quantitative methodology, and that ethical guidelines like those endorsed by the American Psychological Association (see https://www.apa.org/ethics/code/)) have been observed.

Sampling

Sampling focuses on the way subjects (e.g., consumers, households, students) are obtained for inclusion in a sample. How subjects were sampled speaks directly to the generalizability of study findings, which depends on specifying a population to generalize study findings to. Sampling can also involve study conditions, settings, instruments, etc. (Shadish, Cook, & Campbell, 2002), but we focus on subjects such as students and schools. By definition, a population is a collection of subjects that cannot usually be accessed which we wish to generalize study findings to, for example, all seventh grade mathematics students in the upper Midwest of the U.S. in the 2018-2019 school year. A sample is a chunk of a population that is used to generalize to a population of interest. The importance of generalizing study findings cannot be over-emphasized: A fundamental goal of much quantitative research is to identify interventions or conditions that improve outcomes like mathematics achievement for large numbers of subjects. The extent to which study findings can be accurately generalized to a population is often referred to as external validity (Campbell & Stanley, 1963), i.e., how externally valid are study findings? The way a sample was obtained speaks directly to external validity.

Types of Sampling Mechanisms

Two basic sampling mechanisms are available: probability-based (random) sampling and non-probability (non-random) sampling. The former is the recommended standard (WWC, 2017) because it supports strong external validity whereas the latter typically does not.

In probability-based sampling, a population is specified, a sampling frame consisting of a list of every subject in the population is constructed, each subject in the population is assigned a unique identifying number (id), and a random process is used to generate a sample of N numbers. The latter usually involves a random numbers program in computer software like SPSS (IBM Corp., 2011) or Stata (Stata Corp, 2015). In the final

step, N subjects with ids corresponding to the random numbers produced by the software are selected for the sample. This process ensures the probability of sampling each subject in a population is known (i.e., $\frac{1}{N_{pop}}$ assuming a large population and a comparatively small sample, N_{pop} = number of subjects in the population). The logic underlying generalizability is simple: Because each subject has the same opportunity to be sampled, characteristics of a sample (e.g., gender, socio-economic status or SES, mathematics achievement) should mimic those in a population and hence sample results should be generalizable to the population.

Common probability-based sampling mechanisms include simple random sampling, stratified random sampling, and cluster (two-stage) sampling (Lohr, 2010). Suppose a researcher wishes to generalize study findings of the impact of a new mathematics curriculum for teaching number ratios to a population of seventh grade students in mathematics classes in the upper Midwest of the U.S. in the 2018-2019 school year. If N_{pop} = 20,000 and probability-based sampling is used, a unique id is assigned to each student in the population via the sampling frame that might range from 1 to 20,000. To obtain a sample of, for example, N = 1,200 a computer program could be used to produce 1,200 random numbers between 1 and 20,000 to identify N students to be sampled. The size of the sample is often a function of statistical power in the data analysis and the choice of N = 1,200 in this example is arbitrary. A simple random sample of size N consists of N subjects selected from the population such that every set of N subjects has the same probability of being sampled.

Stratified random sampling involves carving a population into strata such as those based on SES (e.g., high, medium, low) with known percentages of subjects in each stratum (e.g., 20%, 60%, 20%), and then using simple random sampling to obtain the desired number of subjects from each stratum. Stratified random sampling is used when it is important that the composition of the population (e.g., high/medium/low SES) be represented in the sample, which is not assured if simple random sampling is used. In cluster (two-stage) random sampling a population of organizational units (clusters) such as schools is specified, J clusters are sampled at random (stage 1) and in the typical case all subjects within a cluster are sampled (stage 2).

Despite the strong external validity associated with probability-based sampling, it appears to be uncommon in most educational studies, almost certainly because of the resources needed for probability-based sampling. For example, surveys of published educational studies provide evidence of high rates of non-probability-based sampling, such as Dedrick et al. (2009) and Fath (2014) who reported that 73% of 99 surveyed studies and 93% of 58 surveyed studies used non-probability-based sampling. Probability-based sampling is typically used in large studies such as the U.S.-based Early Longitudinal Childhood Studies (ELCS), or international studies such as Trends

in International Mathematics and Science Study (TIMSS, 2015) or the Program for International Student Assessment (PISA, 2017).

Practical constraints associated with probability-based sampling often result in studies using non-probability-based sampling involving regional or locally-obtained samples. For example, it may not be possible to generate a sampling frame because the number of subjects in a population is unknown, meaning the probability of sampling each subject in a population is unknown. The most common form of non-probability-based sampling occurs when a sample is obtained because it is convenient, which often takes the form of sampling all available subjects locally (e.g., all students in an introductory psychology class in a university) (Battalgia, 2008). Accurately generalizing study findings based on a convenience sample is challenging because of uncertainty about the population the sample represents, leading to weak external validity.

Still, it is important to try to generalize study findings from non-probability-based sampling. An appropriate strategy is for a researcher to provide empirical evidence the convenience sample is similar to a population of interest on selected indicators. This advice is consistent with the report of Wilkinson and the APA Task Force on Statistical Inference (1999):

"Using a convenience sample does not automatically disqualify a study from publication, but it harms your objectivity to try to conceal this by implying that you used a random sample. Sometimes the case for the representativeness of a convenience sample can be strengthened by explicit comparison of sample characteristics with those of a defined population across a wide range of variables." (p. 595)

Suppose a convenience sample of N = 300 students was obtained from three schools in an upper Midwest state but the study goal was to generalize to all seventh grade mathematics students in the state. Providing information about key indicators for the sample and the population of interest can strengthen the case for generalizability. For example, evidence that the percentage of urban/suburban/rural students, Black, Hispanic, and White students, and students in poverty in the sample is similar to that in the state provides indirect evidence supporting generalizability; similarity of educational indicators for the state and the sampled schools such as average pupil/teacher ratios, per pupil spending, and percentage of students who attend a post-secondary institution provides additional evidence of generalizability (In the U.S. the latter information is available through the Digest of Education Statistics and the Bureau of the Census).

Two other data characteristics can provide important challenges to valid generalizations. One is attrition (missing data) which occurs for a variety of reasons. For example, once a sample is identified students may initially participate in a study but then move, parents may refuse to allow their children to participate in a study or to complete a study, or

schools that initially agreed to participate subsequently decide not to. These kinds of sampling difficulties lead to missing data and can seriously undermine the generalizable of study findings because sampled students, schools, etc., with missing data may differ from those who provided complete data in ways that impact inferences.

A second challenge to valid generalizations is lack of independence of subjects and hence their data, which can seriously distort inferences particularly from data analyses. Both probability-based and non-probability-based sampling can produce dependency but the latter is typically more likely, for example, all students in a school are sampled (convenience sample) which may include siblings, students studying together in a class, etc. Researchers should carefully examine the sampling process for evidence of dependency, which, if present, can have a devastating impact on inferences.

Examples of common methodological challenges

As suggested above, a common methodological challenge in sampling is attrition, which can undermine generalizability. We provide a brief example of this methodological challenge for each sampling method and advice for novice researchers.

In simple random sampling, suppose a researcher receives funding to examine the impact of a new online method for teaching English to non-native English speakers in the seventh grade as measured by a test of written English. The research question is: Does online teaching of English to seventh grade non-native speakers improve their written English? The population of interest is all seventh grade non-native English speakers in the upper Midwest of the U.S. who have indicated that Somali, Hmong, Spanish, or French was their native language. The researcher decides a simple random sample of N = 600 non-native English speakers is needed. Schools and students already using the online method for teaching English are excluded.

Suppose 20,000 eligible students define the sampling frame based on information provided by the U.S. Department of Education. Parental consent is required for a student to participate in the study, and the researcher anticipates 50% of the students will not be eligible to participate because their parents will not consent based on previously reported rates in the literature (which represents attrition). After assigning each student in the population a unique 5-digit id ranging from 00001 to 20,000 the random numbers option in SPSS (IBM Corp., 2011) is used to generate a sample of 1,200 5-digit values between 00001 and 20,000 and those students are selected to be in the sample. A letter is then sent to the parents of the 1,200 students asking them to allow their student to participate in the study--if 50% consent the resulting sample will be (.50)(1,200) = 600. The consent rate turns out to be 55% meaning (1,200)(.55) = 660 students are eligible. To help ensure generalizability of study findings to the desired population it is important to provide evidence the final sample of 660 students is similar

to the initial sample of 1,200 students. This evidence could take the form of comparing information for students in the population and sample (e.g., socio-economic status, race, gender, test scores), and information about the schools in the population and sample (e.g., percentage of Black, Hispanic, and White students, school poverty rate).

In stratified random sampling, using the information provided in the above example, the researcher decides that the proportion of native speakers of Somali, Hmong, Spanish, and French in the population of non-native English speakers should be represented in the sample and chooses stratified random sampling. Suppose the proportions of Somali, Hmong, Spanish, and French speakers in the upper Midwest are known to be 20%, 20%, 55%, and 5%, respectively. The four strata in this example consist of (20,000)(.20) = 4,000, (20,000)(.20) = 4,000, (20,000)(.55) = 11,000, and (20,000)(.05) = 1,000 students. Assuming a consent rate of 55% (N = 660), applying simple random sampling within strata involves sampling (660)(.20) = 132 Somali and 132 Hmong native speakers, (660)(.55) = 363 native Spanish speakers, and (660)(.05) = 33 native French speakers (N = 660). To help ensure generalizability of study findings to the desired population it is important to provide evidence the final sample of 660 students is similar to the initial sample of 1,200 students. Using stratified random sampling enables the researcher to appropriately generalize study findings based on N = 660 to students in the four strata.

In cluster (two-stage) random sampling, using the information provided in the first example, a researcher is interested in investigating characteristics of teachers and their likely impact on the written English of non-native speakers in the upper Midwest. The researcher decides a random sample of J = 40 teachers (clusters) is needed and expects 30% of sampled teachers to decline to participate in the study (which represents attrition). Suppose J_{pop} = 700 teachers and N_{pop} = 20,000 eligible non-native speakers of English. A sampling frame of the 700 eligible teachers is generated in which each teacher has a unique 3-digit id. The random numbers option in SPSS (IBM Corp., 2011) is used to generate a sample of J = 60 teachers (to take the expected attrition into account) (stage 1) and their students (N = 1,800 assuming 30 students per class, stage 2) are selected to be in the sample. Assuming the actual consent rate is 70% produces 60 - (1-.70)(60) = 42 teachers and (42)(30) = 1,260 students (The latter will shrink if student consent rates are less than 100%). Empirical evidence that the sample of 42 teachers and their students are similar to the original sample of J = 60 and N = 1,800 helps to ensure generalizability of study findings to the desired populations.

In convenience sampling, using the information provided in the first example, the researcher decides to use a convenience sample of N = 1,200 non-native English speakers in the seventh grade. The researcher goes to three nearby schools who have agreed to participate in the study and, assuming the consent rate is 55%, produces

a sample of 660 students. Demonstrating this sample is similar to the population of seventh grade students in the upper Midwest is critical to generalizability arguments.

Practical advice

We offer five pieces of advice on sampling to novice researchers assuming a quantitative study in education is to be performed:

1. The importance of external validity argues for probability-based sampling but this sampling method is uncommon. Consider using a large publicly available dataset like Early Longitudinal Childhood Studies in the U.S. and TIMSS or PISA internationally because these studies employ probability-based sampling. Datasets of this kind may also contain collateral information that provides evidence the resulting sample is similar to the population of interest on key indicators such as poverty rates.

2. The sampling process should be carefully examined to help ensure subjects are independent because dependency in the data subjects provide (e.g., mathematics test scores) can have a devastating effect on inferences from data analyses that assume independence such as multiple regression. Evidence of dependency should prompt actions to help ensure independence of subjects, for example, if siblings are identified randomly select one sibling for inclusion in the sample and omit the remaining sibling(s).

3. If non-probability-based sampling is used, it is particularly important to provide empirical evidence supporting generalizability, such as the similarity of student demographics in the sample and the population of interest, as well as similarity of important school-based indicators like per pupil spending or poverty rates. Similar summaries support at least some generalizability, but if there is little similarity between the empirical evidence for a sample and the population of interest external validity will be severely compromised and the value of the study undermined. Researchers should plan on collecting relevant information to make these empirical comparisons.

4. In practice, more than N subjects would often be sampled because the final N will likely be smaller due to attrition. In all instances, provide evidence that subjects who attrited are similar to those who participated in a study.

5. It is important to report inclusion and exclusion criteria of the sampling procedure. For example, restrictions on age, race, or socio-economic status (SES) of the sample or the use of strata should be made clear (Appelbaum et al., 2018). This information will help clarify the population which study results ideally can be generalized to.

Research Design

Research design represents the

"... glue that holds the research project together. A design is used to structure the research, to show how all of the major parts of the research project—the samples or groups, measures, treatments or programs, and methods of assignment—work together to try to address the central research questions." (Trochim & Land, 1982, p. 1)

A study's research design is important because it largely dictates the strength of causal inferences that can be drawn from study findings. Studies that credibly draw strong causal inferences answer the question that permeates quantitative research: Does A cause B and if so under what conditions and for whom? Harwell (2011) encouraged researchers to select a research design supporting strong causal inferences, and the Council for Exceptional Children (2014) similarly stated that "causality could be reasonably inferred from research designs when they are well designed and conducted" (p. 1). Summarizing the strengths and weaknesses of different designs based on methodological standards and pointing novice researchers towards stronger designs should promote stronger inferences. Note that providing evidence of a causal effect requires a design with at least two conditions (typically groups), often labeled treatment and control, which constitute an independent variable.

A critical feature of causal inferences is that estimates of a treatment effect are unbiased, for example, the difference between the outcome (dependent variable) means of treatment and control groups represents, beyond random variation, the causal effects of an independent variable. Put another way, strong causal inferences imply there are no serious alternative explanations for the observed effect of an independent variable on an outcome, implying strong internal validity (Shadish, Cook, & Campbell, 2002). A study with weak internal validity implies weak external validity even if probabilistic sampling was used because internally invalid results cannot typically be validly generalized.

Types of Research Designs

What Works Clearinghouse (2017) describes three categories of group-based research designs to choose among: Randomized control trials (RCTs), quasi-experimental designs (QEDs), and regression discontinuity designs (RDDs).

Randomization is often characterized as the gold standard of research design because its produces probabilistically unbiased treatment effect estimates (i.e., if the study was repeated many times, the average treatment effect will be unbiased), supporting strong causal inferences. This occurs because randomization ensures (probabilistically) that

subjects in the treatment and control groups are equal in observable and non-observable characteristics at the study onset (e.g., SES, gender, mathematics achievement), and consequently differences between groups after the treatment has been applied and its effects measured are attributed to the treatment and not other (confounding) variables (e.g., SES, gender). Traditionally, randomization is described as assigning N subjects at random to a treatment or control group using a random process (there can be multiple treatment groups), such as a coin flip or generating N random binary numbers using a computer program such that subjects receiving a 1 are assigned to treatment and those receiving a 0 to control. Thus, the probability of a subject being assigned to the treatment or control group is .50.

By definition, a control condition implies the treatment under study is not present and a true control group is one in which subjects receive no treatment of any kind related to the study. For example, if an RCT was used to study the effects of different doses of caffeine (e.g., 0 milligrams, 250mg, 500mg, 1000mg) on cognitive functioning the 0mg condition represents a true control group because these subjects receive no caffeine. Evidence of a difference in treatment-control outcome means would (beyond random variation) be attributed to the causal effect of caffeine. However, control conditions often represent “business as usual” in that subjects receive the current treatment or practice. For example, seventh grade students in a control group continue to use the current mathematics curriculum in a school whereas those in a treatment group use a new curriculum, or nurses in a control group in a hospital interact with patients in traditional (“business as usual”) ways (about three minutes per interaction), whereas those in a treatment group limit their interactions with patients to about one minute. Thus “business-as-usual” resembles a treatment and a difference between treatment and control means under random assignment is likely due to the treatment, but the possibility remains the business-as-usual curriculum strengthened or weakened the treatment-control mean difference.

Despite the critical advantage of unbiased treatment effects, practical and policy constraints on assigning subjects to treatment or control groups often make RCTs impractical. For example, students assigned at random to a treatment group may need to be pulled out of class to participate in a study which a teacher or parent may not allow, asked to remain after school which schools or parents may balk at, or students randomly assigned to a control group are subsequently moved to the treatment group at the insistence of a parent. A popular version of random assignment that responds to many practical and policy constraints of traditional RCTs involves assigning higher level units (clusters) such as schools at random to treatment or control conditions, and are known as randomized cluster designs. The growth of hierarchical data analyses (Raudenbush & Bryk, 2002) has played a key role in the popularity of randomized cluster

designs (Kleinman, 2017). Hierarchical (multilevel) analyses analyze data obtained from hierarchical structures in which lower level units, such as students, are clustered within higher level units (clusters), such as schools. Hierarchical data in these analyses are the result of two-stage (cluster) sampling.

For example, suppose the impact of a new curriculum for teaching number ratios to seventh grade students is studied by randomly assigning J = 42 schools to either a treatment condition in which teachers in a school use the new curriculum (treatment), or a control condition in which teachers use the existing (business-as-usual) curriculum. All students complete a test of number ratios at the conclusion of the study which serves as the outcome variable. The fact that all students in a school are in the treatment or control condition is likely to make random assignment more acceptable while still producing unbiased estimates of the treatment effect. Appelbaum et al. (2018) encouraged researchers to describe the units of randomization as well as the procedures used to generate the random assignment sequence, for example, assigning classrooms using randomly generated 0s and 1s.

Practical or ethical constraints on random assignment often leads researchers to employ QEDs. Quasi–experimental designs are used to compare pre-existing groups which define the independent or "treatment" variable. In some cases, the pre-existing conditions cannot be randomly assigned such as SES status (high, medium, low) or gender, whereas in other cases an outcome for subjects already receiving a treatment, such as mathematics achievement scores for students participating in an existing mathematics curriculum, are compared against those of students participating in a new curriculum. The problem with QEDs is that the lack of random assignment means group differences on an outcome may be due to a treatment effect, pre-existing differences between treatment and control groups that affect the outcome (selection bias), or both. Put another way, the probability a subject is assigned to a treatment or control group is not .50 meaning groups are not probabilistically equal and the likelihood of biased estimates of a treatment effect may be high.

For example, treatment schools (teach a new curriculum) may have higher SES than control schools (use an existing curriculum), which leads to the former having higher outcome means because higher SES is usually associated with better mathematics performance even if the new curriculum has no effect. The result is that causal inferences from QEDs are typically much weaker than those associated with RCTs unless the impact of selection bias is controlled. To produce the strongest possible causal inferences with QEDs, methodological standards recommend controlling for selection bias by adding predictors that treatment and control conditions may differ on such as SES in the data analysis, or employing matching procedures which are typically based on propensity scores (Schneider, Carnoy, Kilpatrick, Schmidt, & Shavelson, 2007).

Regression discontinuity designs (RDDs) are increasingly used to assess the impact of treatment and control conditions when RCTs are not feasible. The basic RDD is a pretest-posttest two group (treatment, control) design. In a RDD, a variable which is typically a pretest is used to create a cutoff with cases with scores below and above the cutoff assigned to treatment and control groups (or vice versa). The groups are then compared on the change (discontinuity) in the pretest-posttest relationship at the cutoff (posttest is the outcome variable). The logic of RD is based on the crucial role of pretests in taking subject differences into account (Steiner, Cook, Shadish, & Clark, 2010), in that subjects with similar pretest scores can often be treated as approximately equal on background variables such as SES, enhancing causal inferences (Bloom, 2010).

For example, Jitendra, Harwell, Lm, Karl, and Slater (2018) used a RDD to examine the impact of an intervention designed to improve the mathematical problem-solving skills of students categorized as being at risk for having significant mathematical difficulties. A pretest measuring these skills (also referred to as the 'forcing' or 'running' variable) was used to categorize students as at risk for significant mathematical difficulties using a cutoff score of 9 which corresponded to the 35th percentile. Students with scores equal to or below 9 were at risk for significant mathematics difficulties and those above the cutoff had a modest risk of mathematical difficulties. In Jitendra et al. (2018) all students received the intervention because the research question was whether the intervention was more effective for students at risk of having significant mathematical difficulties, i.e., the independent variable was whether a student had a high or modest risk for significant mathematical difficulties; in other RDD applications an intervention would only be administered to students with pretest scores below (or above) the cutoff (e.g., Robinson, 2010).

Subjects can also be assigned to treatment and control conditions in RDDs based on collateral information. Consider a study assessing the impact of an intervention designed to reduce the number of student school suspensions for misbehavior. A school policy might be used to generate a cutoff, such as a policy in which students who are tardy five or more times are automatically suspended. Students who have been tardy five or more times are assigned to the treatment group and those tardy one to four times to the control group.

There are two types of RDDs: sharp RDD and fuzzy RDD. The former means the probability of being assigned to treatment changes from 0 to 1 (or 1 to 0) at the cutoff. A fuzzy RDD arises when the probability of being assigned to treatment changes from 0 to a value somewhat less than 1 (or a value somewhat greater than 0 to 1) at the cutoff. An example of a fuzzy RDD is when a researcher decides to assign subjects to treatment who were close to but slightly above the cutoff. Sharp RDDs are preferred because inferences about the treatment effect are clearer and analyses are simpler. The

assumptions of RDDs needed to support causal inferences should be checked including an outcome variable that should be measured in the same manner for both treatment and control groups, student scores on the cutoff variable were not manipulated, and the relationship between the cutoff variable (e.g., pretest) and outcome variable (e.g., posttest) is linear; otherwise the analysis must include predictors capturing the nonlinearity (Smith, Levesque, Kaufman, & Strumpf, 2017, pp. 941-942).

Despite the absence of random assignment to treatment and control groups properly constructed RDDs support strong causal inferences. As noted above, it is often reasonable to assume subjects at the cutoff are quite similar in ways related to their performance on the posttest. Hence, in Jitendra et al. (2018) comparing the posttest scores of students scoring 9 on the pretest and students scoring 10 should produce an unbiased (or almost unbiased) estimate of the difference between those categorized as having a high risk of significant mathematics difficulties and those with a modest risk because students with similar pretest scores are likely to be similar on many other characteristics related to performance on the outcome variable. A small mean difference on the posttest implies the intervention is equally effective for students categorized as having a high versus a modest risk of significant mathematics difficulties, and a non-negligible posttest mean difference that the intervention had a differential effect on the two groups of students. Similarly, comparing the posttest scores of students with pretest scores of 8 or 9 against those of students with pretest scores of 10 or 11 should also produce unbiased or nearly unbiased estimates of the intervention effect, and so on.

It is important to mention correlational designs (CDs) which are common in educational research, for example, TIMSS (2015) and PISA (2017) data were obtained from a CD. CDs are non-experimental designs and are not part of the WWC (2017) standards because of their inability to support causal inferences. The defining characteristic of a CD is that a single group of subjects is measured on two or more variables whose relationship is examined, which is consistent with Ellis and Levy's (2009) and Creswell (2012) description of these designs as determining the presence and degree of the relationship between variables. The absence of treatment and control conditions means causal inferences for data obtained from such designs are extremely difficult to justify. The Council for Exceptional Children (2014) stated "identifying evidence-based practices involves making causal determinations, and causality cannot be reasonably inferred from correlational designs (p. 2)".

Examples of Common Methodological Challenges

Attrition is a common challenge that can cause or aggravate selection bias, which is the most severe methodological challenge in research design because it can undermine causal inferences. We provide a brief example of a methodological challenge for each

research design and general advice for novice researchers.

In RCTs, to assess the impact of a year-long online method for teaching English to non-native English speakers in the seventh grade in the upper Midwest in the U.S., a researcher employs a RCT design in which each of N = 660 sampled students will be assigned at random to a treatment group in which students are given access to the online method of learning English, or a control group in which students are not given access to the online method (n = 330 per group). The outcome variable is a test of written English administered at the end of one-year. To assign students at random the SPSS (IBM Corp., 2011) computer program is used to generate N = 660 binary numbers (0, 1) such that 330 are 0s and 330 are 1s; students with a 1 are assigned to the treatment condition and those with a 0 to the control condition. An important challenge in RCTs is ensuring that whatever attrition exists is similar in treatment and control groups (WWC, 2017). If 5% of treatment students and 5% of control students are lost (missing data) then estimates of an intervention effect can often still be treated as unbiased (or almost unbiased); if 20% of treatment students and 5% of control students are lost estimates of an intervention effect are more likely to be biased.

In QEDs, using the same information provided in the previous example, a researcher turns to schools already applying the new online method for teaching English to non-native speakers of English and defines n = 330 students in these schools as representing the treatment group. Another 330 students were obtained from schools not using the online method and represent the control group. The most severe methodological challenge is selection bias meaning the treatment and control groups differ on the outcome at the study onset due to variables that confound (bias) comparisons. For example, the treatment group may have a higher (or lower) percentage of students in poverty, more (or less) access to high quality internet service, or stronger (or weaker) English teaching all of which affect the outcome. Collecting data on potentially confounding variables that can bias treatment and control comparisons is critical for controlling their effects (e.g., by including these variables as predictors in data analyses or employing matching procedures based on propensity scores).

In RDDs, using the information provided above, the researcher decides to utilize a RDD in the study of an online method to teach English to non-native English speakers. A test of written English administered at the beginning of the school year to non-native English speaking seventh grade students serves as the forcing variable, i.e., students scoring below a specified value, such as the score corresponding to the 35th percentile, are assigned to the treatment group (given access to the online method for learning English) or are assigned to the control group (no access to the online method for learning English). The test of written English administered at the end of one year serves as the posttest.

One important methodological challenge in RDDs is attrition which should be tracked in the treatment and control groups. Another challenge is choosing a forcing variable and associated cutoff that provides results that speak to the research question motivating the study. For example, Jitendra et al. (2018) chose a pretest as the forcing variable and a score corresponding to the 35th percentile as the cutoff based on considerable prior research results for identifying students at risk of significant mathematical difficulties. A different cutoff choice by these authors, for example, a pretest score corresponding to the 50th percentile, would still be expected to produce an unbiased (or almost unbiased) estimate of a treatment effect but the choice of a non-literature-based cutoff would likely undermine the usefulness of study results.

In CDs, the researcher is interested in investigating the relationship between the written English proficiency of seventh grade students who are non-native English speakers enrolled in an online method for learning English, and variables such as students' grade point average and score on a standardized test of English literacy. The researcher continues to sample students who have been using the online method until N = 660 are obtained, who are subsequently administered the test of written English. Several methodological challenges are linked to this design but the most important is not having treatment and control groups, which means the effectiveness of the online method cannot be directly studied.

Practical Advice

We offer five pieces of advice on research design to the novice researcher:

1. Producing unbiased estimates of effects should be the goal of quantitative studies. The recommended standard is randomly assigning subjects to treatment and control conditions because this should produce unbiased estimates of a treatment effect and support strong causal inferences.

2. The use of an RCT does not guarantee unbiased estimates and strong causal inferences unless factors that can undermine such inferences are controlled. The WWC (2017) stated that researchers should be particularly concerned about attrition (missing data). It is a good idea to report the percentage of missing data in the treatment and control groups as well as for each variable. Differential attrition refers to a difference in the attrition rates for the treatment and control groups and can represent a severe threat to valid inferences. Every effort should be made to minimize attrition. Remedies such as data imputation, which produce complete data, require rigorous assumptions be met.

3. In many settings, random assignment is impossible and QEDs comparing existing groups are used. Such designs are prone to selection bias in which groups a priori

differ on an outcome due to the presence of confounding variables that are not equally distributed across the groups and are correlated with an outcome. Every effort must be made to eliminate this bias, which typically takes the form of statistical control through the use of predictor variables in regression models or matching using propensity scores (Schneider et al., 2007).

4. RDDs represent a powerful tool that can produce unbiased (or nearly unbiased) estimates and support strong causal inferences. A key to these designs is employing a forcing variable (e.g., pretest) that through an appropriately chosen cutoff score creates treatment and control groups. In general, a RDD should be employed before a QED if at all possible.

5. Methodological standards provide no place for CDs because they cannot support strong causal inferences. These designs should generally be limited to preliminary research studies in which the goal is to provide empirical evidence of relationships among key variables.

Instrumentation

The importance of using accurate instruments (tests, surveys, questionnaires) with exemplary psychometric properties in the educational sciences is well documented (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014; Biemer & Lyberg, 2003; Danner et al., 2016; Fry, 1960; Kane, 2001, 2013; White, Carey, & Dailey, 2001). We employ the definition of instrumentation provided by Hsu and Sandford (2010):

"Instrumentation refers to the tools or means by which investigators attempt to measure variables or items of interest in the data-collection process. It is related not only to instrument design, selection, construction, and assessment, but also to the conditions under which the designated instruments are administered—the instrument is the device used by investigators for collecting data." (p. 608).

Measurement instruments represent the foundation of empirical research in the educational sciences (Danner et al., 2016) yet selecting, modifying, or constructing instruments that support reliable and valid interpretations of scores is challenging, likely more so for novice researchers. The goal of this paper is to encourage novice researchers to employ available standards for instruments (e.g., AERA, APA, NCME, 2014; Council for Exceptional Children [CEC], 2014; WWC, 2017).

Psychometric Properties of Measurement Instruments

The two critical properties of measurement instruments are the reliability and validity of interpretations and uses and consequently inferences made using instrument scores

(Haladyna, 2004; Haladyna & Rodriguez, 2013; Kane, 2013, 2016; Linn, 2006). The need for instruments with strong psychometric properties, and the difficulty of constructing such instruments, is well known (WWC, 2017). Unsurprisingly, educational research is plagued by poor instruments, in large part because of a belief that constructing psychometrically strong instruments is a modest task when the opposite is true.

Reliability and validity standards are typically applied to outcome variables in a study but are often relevant for other variables such as predictors in regression analyses. For example, in Harwell et al. (2009) student socio-economic status (SES), high school grade point average in mathematics classes, and year enrolled served as predictors. Applying instrumentation standards to these variables speaks to the reliability and validity of inferences based on these variables.

Reliability is not an absolute property of an instrument but rather refers to the amount of measurement precision (consistency) (Reynolds & Livingston, 2012) of scores. Reliability coefficients range between 0 to 1 or -1 to 1 depending on the coefficient, and instruments with more items should generally produce higher reliability because they provide more information. For example, suppose the reliability coefficient of a test intended to measure the construct proficiency with fractions equals .90. This value means that 90% of the variation in test scores is due to the construct and 10% reflects measurement error.

Another interpretation of reliability is the following: If a sample of subjects are given the same instrument twice and the rank-order of scores is quite similar across assessments, the reliability of inferences based on scores is high. In this case, the subject with the highest score at time 1 also likely obtained the highest score at time 2 (it is not necessary that subject 1 obtain the same score on both assessments), the subject with the second-highest score at time 1 also is likely to have the second-highest score at time 2 (it is not necessary that subject 2 obtain the same score on both assessments), and so on. On the other hand, if a sample of subjects is given the same instrument twice and the rank-order of scores is quite different across assessments reliability will be low, for example, the subject with the highest score at time 1 likely does not obtain the highest score at time 2, the subject with the second-highest score at time 1 likely does not obtain the second-highest score at time 2, and so on.

Several measures of reliability are available. If an instrument is administered twice a Pearson product-moment correlation typically serves as a reliability measure. If a single assessment is used, Cronbach's alpha is popular and is available in most computer programs performing data analysis. However, Cronbach's alpha has significant deficiencies (Dunn, Baguley, & Brunsden, 2014; Green & Hershberger, 2000; Raykov, 2001; Tang & Cui, 2012; Yang & Green, 2011; Zhang & Yuan, 2016; Zimmerman, Zumbo,

& Lalonde, 1993; Zinbarg, Revelle, Yovel, & Li, 2005). Even Cronbach expressed concerns over the usefulness of alpha as it covers only a modest percentage of measurement uses for which reliability information is needed (Cronbach & Shavelson, 2004). A key assumption of coefficient alpha is that all items on an instrument measure the same construct (e.g., mathematics achievement) and possess the same factor analysis loadings which capture the relationship between each item and the construct (the essentially tau-equivalent model), which may not occur in practice An arguably more realistic measure of reliability is the omega coefficient which also assumes items measure the same construct but allows factor loadings to vary (The congeneric model) (McDonald, 1999). Omega is available in R (R Core Team, 2018) and the jMetrik software (Version 2.1.0; Meyer, 2011) both of which can be downloaded without charge.

Reliability coefficients $\geq$ .80 are often acceptable (CEC, 2014) although a variety of factors impact minimally acceptable values, such as the characteristic or trait being measured and the purpose of the instrument. For example, a reliability of .70 would likely be unacceptable for a test of mathematics achievement used in making college admission decisions but perfectly acceptable for a questionnaire being developed to assess attitudes towards public education. An infrequently used but promising approach to determine minimally acceptable reliability is to employ a decision criterion (Gugiu & Gugiu, 2018).

Validity is the accuracy with which inferences about a subject's status are made based on their score. Like reliability, validity is not an absolute property of an instrument but refers to the proposed interpretations and uses of scores. Chan (2014) summarized this perspective: "Validity is about the inferences, claims, or decisions that we make based on instrument scores, not the instrument itself" (p. 10). The AERA, APA, and NCME (2014) instrumentation standards provided a similar definition:

"Validity refers to the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests. Validity is, therefore, the most fundamental consideration in developing tests and evaluating tests. The process of validation involves accumulating relevant evidence to provide a sound scientific basis for the proposed score interpretations. It is the interpretations of test scores for proposed uses that are evaluated, not the test itself." (p. 11)

Validity is best thought of as the single overall judgment of the adequacy and accuracy of an instrument's interpretation or intended use. Several types of validity evidence are available but four are especially prominent and often overlap: face validity, content validity, criterion validity, and construct validity. The WWC (2017) standards emphasized the importance of face validity evidence, which reflects the extent to which an instrument appears to do what it claims. For example, a test of written English

proficiency that required U.S. students to interpret political cartoons from the United Kingdom in order to complete items would likely be viewed as lacking face validity.

Content validity evidence refers to the extent to which an instrument reflects relevant facets of an underlying construct like proficiency with fractions. Evidence of content validity is often provided by a logical evaluation of the degree to which items cover relevant facets (often called an instrument's blueprint), for example, the extent to which items reflect the steps needed to solve fraction problems. Both face validity and content validity evidence typically includes the judgments of experts who represent the domain of the intended uses of the instrument such as teachers, college admissions officers, or public policy staff.

Criterion validity evidence can be concurrent or predictive. Concurrent validity evidence assesses the relationship between an instrument and an existing measure which ideally has strong psychometric properties. Predictive validity evidence reflects how well scores predict a future outcome, for example, the extent to which scores of seventh grade students on a test of fractions predict their performance on an algebra test in eighth grade. Criterion validity evidence can be assessed by estimating the correlation coefficient between an instrument and current (concurrent) and later (predictive) performances.

Construct validity evidence reflects the extent to which inferences about a construct such as proficiency with fractions is accurate. Evidence of construct validity is typically both theoretical and empirical. The former reflects the expected structure of instrument items (e.g., all items reflect a single construct depicted in a theoretical model and test blueprint), and the latter takes the form of non-negligible correlations between instrument scores and variables these scores are expected to be related to (e.g., student scores on a test of fractions and teacher ratings of students' mathematics proficiency). Construct validity evidence can also be generated using factor-analytic techniques. Deciding which type(s) of validity evidence to obtain and report is a critical decision and should be based on the intended interpretations and uses of instrument scores.

The relationship between reliability and validity is important but somewhat confusing because they are distinct yet related concepts. An instrument supporting reliable inferences may not support valid inferences. For example, a test of proficiency with fractions may produce consistent scores over repeated test administrations but not cover the domain it purports to or fail to predict future performance on an algebra test. However, a test with validity evidence must possess reliability because valid inferences about scores must be consistent.

In sum, measurement instruments with strong reliability and validity evidence strengthen inferences based on instrument scores, whereas those with weak

reliability and validity evidence can undermine inferences (Hsu & Sandford, 2010). The following sections illustrate the options available for selecting, modifying, or creating instruments, recommendations for instrument administration and data collection, common challenges using instruments and how to respond to them, and practical advice targeting novice researchers.

Options for Instruments Used in Data Collection

Researchers have three options for instruments: Select a published (existing) instrument in its current form, modify an existing instrument, or construct a new instrument (Creswell, 2012). This choice is often a critical methodological decision that can significantly enhance or undermine the quality of a study's findings. We urge researchers to employ the above order in practice, i.e., select an existing instrument with evidence of strong psychometric properties if possible, modify an existing instrument with evidence of strong psychometric properties if necessary, and construct an instrument as a last resort.

Gay and Airasian (2000) outlined seven factors to consider in selecting an existing instrument: "(1) The name, publisher, and cost, (2) a brief description of the purpose of the instrument, (3) validity and reliability data, (4) the group for whom the instrument is intended, (5) administration requirements, (6) information regarding scoring and interpretation, and (7) reviewers' overall impressions" (p. 145). We encourage novice researchers to begin their search for an existing instrument with the "*Mental Measurement Yearbook*" (MMY) published by The Buros Center for Testing at the University of Nebraska-Lincoln. These yearbooks appear every 3-5 years and contain reviews by professional educators of hundreds of instruments in the educational sciences (Carlson, Geisinger, & Jonson, 2017). The reviews contain information about the purpose, population, publication dates, administration time, score scale, price, technical issues, and psychometric properties of instruments. The instruments reviewed assess a wide range of content, for example, mathematics, reading, and science achievement, auditory perceptual skills, behavior assessment, foreign language proficiency, job related skills, intelligence and aptitude, personality traits, and teaching quality. Instruments with positive MMY reviews that meet the needs of a study deserve careful consideration whereas those with negative reviews should generally be avoided.

A second option is modifying an existing instrument. Modifications often take the form of simplifying the wording of directions and items, adding or deleting items, and extending or shortening the time to complete the instrument. Modifications should be made after obtaining the approval of the instrument author(s) and publisher which can be a lengthy and complex process. In addition, the psychometric properties of the original instrument do not necessarily apply to the modified instrument.

A third option is constructing a new instrument. Guidance in developing and validating an instrument is available through the standards published jointly by AERA, APA, and NCME (2014). A careful review of the steps of constructing an instrument detailed in these standards shows that developing and validating a psychometrically strong instrument is a complex and time-consuming task that can take years. If a researcher designs their own instrument the rationale for doing so should be provided and should include evidence (a) of a paucity of existing instruments available for measuring the construct(s) of interest in a study, (b) that the new instrument represents a significant contribution to a field, (c) that the design and validation of the instrument is consistent with recommended standards.

Below is a summary of the steps for constructing a new measurement instrument laid out in the AERA, APA, and NCME (2014) standards:

- Determine the purpose and rationale for designing a new instrument and the intended interpretations and uses of scores as well as the target population.
- Review related literature to provide deep insight into the construct(s) being measured.
- Operationally define the construct(s) and their sub-dimensions (components) if relevant (i.e., construct a test blueprint).
- Construct an item pool that covers relevant facets of a construct. An important decision in this process is item format, for example, multiple choice, open-ended items, or rating scales.
- Ask content experts to review and revise the item pool as needed given the instrument's purpose, intended interpretations, and target population.
- Select items from the item pool to comprise the first draft of the instrument based on their content coverage, readability, and fairness.
- Utilize the "thinking aloud" strategy among those constructing the instrument and a small group of examine in which reactions to the instrument are shared to further refine the first draft.
- Plan to administer the initial draft in a pilot study in a way that ensures data collection bias will be minimized (date, time, sampling, scoring, data collector characteristics).
- Score responses from the pilot study using theoretically-grounded rubrics to score open-ended items if present.

- Estimate the psychometric properties (reliability and validity).
- Refine the instrument based on the results of the pilot study.
- Repeat the above steps as needed. In many instances, an instrument is not ready for use after a single piloting.

In sum, researchers ideally select an existing instrument that possesses evidence of strong psychometric properties or modify an existing instrument. Researchers who choose to construct an instrument should follow the AERA, APA, and NCME (2014) guidelines for doing so and should recognize that the process of developing and piloting an instrument until it shows strong reliability and validity is likely to take considerable time, effort, and resources.

Recommendations for Instrument Administration and Data Collection

Once an instrument is available for data collection in a study, it is important to minimize factors that can undermine data quality. McMillan and Gogia (2014) pointed out the value of researchers carefully selecting the conditions, time, and place for administration to help ensure data quality. Factors like respondent fatigue and mood, environment noise, or test monitors who provide confusing instructions for completing the instrument can produce inaccurate responses, missing data, and random measurement errors which lower reliability. Additional problems that can undermine data quality may emerge if the instrument appears on a computer or tablet, such as internet connection or firewall issues, equipment shortcomings (e.g., unresponsive mouse), or difficulties in the computer program used to deliver the instrument and record responses (e.g., the computer program "freezes"). If an instrument requires raters or observers to assess respondents' performance, it is important that raters be trained such that variability among their ratings is minimized to enhance reliability and validity of inferences (Harwell, 1999).

Examples of Common Challenges in Instrumentation

Various challenges may arise in instrumentation. Perhaps one of the more common challenges is whether an instrument positively reviewed in the MMY should be used in a study with a somewhat different purpose or target population than that of the positively-reviewed instrument. For example, a researcher may use the MMY to identify an existing test that assesses the ability of sixth grade students to solve fraction problems, but discovers that only a test of fractions for fourth and fifth grade students (FRACT) is positively reviewed. Should the researcher administer FRACT to sixth grade students, modify FRACT to make it appropriate for sixth grade students, or develop a new test of fractions that targets sixth grade students? Other instrumentation challenges

include employing a sample consistent with the target population and the availability of individuals with psychometric expertise to analyze item response data and interpret the results. Below we expand on these challenges in the context of selecting, modifying, or developing a new instrument. FRACT is the example used to illustrate such challenges.

Suppose a researcher turned to the MMY for a published test measuring the proficiency of sixth grade students' proficiency with fractions. The MMY produced a positively-reviewed test (FRACT) designed for fourth and fifth grade students but none for sixth grade students. FRACT was published in 2010 after a lengthy development process that followed AERA, APA, and NCME (2014) recommendations, consist of multiple choice and open-ended items, and has evidence of strong reliability and construct validity. If the researcher administers FRACT to sixth grade students, the reliability and validity of test-based inferences may be incorrect, but if the researcher decides to not use FRACT in its published form either FRACT needs to be modified to accommodate sixth grade students or a new instrument needs to be developed.

Continuing with the above example, suppose the researcher decides to modify FRACT to ensure it is appropriate for sixth grade students. The modifications include revising the wording in test directions and test items, increasing the difficulty of items, and reducing the time allotted to complete the test. The researcher contacts the FRACT author(s) and test publisher for permission to modify the existing instrument. After months of negotiations over the modifications, the author(s) and publisher agree to the modifications, but are concerned that the strong psychometric properties of the original test may not transfer to the modified version. To respond to this concern, the researcher plans to follow the recommended steps of the AERA, APA, and NCME (2014) test standards, and to provide evidence the properties of the modified and original instruments are similar by piloting the modified instrument and reporting reliability and validity evidence.

Suppose instead the researcher plans to construct a new instrument (FRACT2) that targets the proficiency with fractions of sixth grade students. The researcher begins by examining the recommendations in the AERA, APA, and NCME (2014) standards. If the researcher does this on their own it is likely to take several months, a year, or longer; if a team of researchers are involved the process presumably takes less time. The steps are:

- Clarify the purpose of the test and the target population (e.g., measuring the proficiency with fractions of sixth grade students).
- Review literature related to assessing the proficiency with fractions of sixth grade students to identify the desired skills that should be covered in the test (test blueprint) such as the ability to recognize common underlying problem structures, represent problems using visual-schematic diagrams, plan how to

solve problems, and solve and check the reasonableness of answers.

- Construct test items that will elicit the desired skills. The researcher decides that 20 multiple choice items and 10 open-ended tasks will appear on the test. Typically more items are developed than appear on the final version of the instrument because piloting the instrument will likely reveal items that perform poorly and should be discarded. As a result 30 multiple choice items and 15 open-ended items are developed. It is important to construct items that avoid culturally dependent or insensitive language (e.g., a fraction problem involving the number of rooms in a student's household when some students may be homeless or what constitutes a room in a household may vary by culture).

- Identify content experts (e.g., teachers, faculty researchers) who review and revise the items in terms of readability and suitability for sixth grade students. This feedback prompts revision of the items and the development of a scoring rubric for open-ended items.

- Utilize a "thinking aloud" strategy in which a group of 15 sixth grade students read the test directions and items and provide feedback on their readability and what they believe is an appropriate response. This feedback is used to further revise the test.

- Pilot an initial version of the test using a sample of N = 300 sixth grade students. This sample size should be large enough to ensure pilot data can be confidently used to estimate the psychometric properties of the test along with information about the adequacy of the testing protocol (e.g., directions given to students, time allotted for completing the test).

- Score student responses from the pilot study and compute reliability using the omega coefficient which allows items to have different loadings on the factor "proficiency with fractions" and supports different item formats (binary scoring, open-ended scoring) in the same instrument. Correlate test scores with collateral information such as scores from a standardized test of mathematics to provides evidence of criterion validity.

- Develop a transparent set of guidelines for keeping or omitting items based on the results of the pilot study. For example, the pilot data may suggest 12 multiple-choice items and five open-ended items should be discarded. At this point, one of two things happens: (a) The researcher decides the instrument has satisfactory psychometric properties (e.g., omega coefficient of the remaining 18 + 10 = 28 items is .86, correlation of standardized mathematics scores and FRACT2 scores is .45) and should be used to collect data in the main study, or (b) The researcher

decides the instrument has unsatisfactory psychometric properties (e.g., omega coefficient of the 28 remaining items is .62 and additional items need to be written, correlation of standardized mathematics scores and FRACT2 scores is .12). In this case, the test must go through another round of development and piloting.

Practical Advice

We offer three pieces of advice on instrumentation challenges to novice researchers:

1. The impact of instruments on study-based inferences as a function of their reliability and validity evidence speaks to the need to employ instruments with strong psychometric properties. Put bluntly, it is difficult to over-emphasize the damage a poor instrument can do to inferences from otherwise well-designed studies. The use of existing instruments with compelling evidence of strong psychometric properties is always preferred assuming the instrument is consistent with a study's purpose, intended interpretations, and target population. On the other hand, a well-reviewed existing instrument that does not meet these conditions should not be used.

2. Modifying an existing instrument is typically preferable to constructing one but the possibility the modified test performs differently from the original in ways that affect its psychometric properties should be acknowledged and studied. This will likely involve following several steps of the AERA, APA, and NCME (2014) standards such as piloting the modified instrument.

3. Researchers should not construct an instrument for a study unless it is absolutely necessary to do so, and in this case the AERA, APA, and NCME (2014) standards for test construction should be followed to help ensure the instrument possesses strong psychometric properties. This is often a time consuming process that even under ideal circumstances will require significant resources and take several months to more than one year.

The Extent to Which a Sample of U.S. and Non-U.S. Quantitative Education Studies Capitalize on Recommended methodological Standards

The paper's premise that researchers often do not capitalize on recommended sampling, research design, instrumentation and standards was assessed using a sample of U.S. and non-U.S. published studies in education. For the U.S. studies, we sampled studies appearing in the American Educational Research Journal (AERJ), the flagship journal of AERA, in 2016 (Vol. 53) and 2017 (Vol. 54). For non-U.S. studies we surveyed the International Journal of Educational Research (IJER) published by the European

Association for Research on Learning and Instruction in 2016 (Vol. 75 - Vol. 80) and 2017 (Vol. 81 - Vo. 86). IJER is an international outlet for educational research conducted in Africa, Asia, Australia, and Europe.

For sampling, a study was coded 4 if all participants were selected at random, 3 if some participants were selected at random (e.g., random sampling of schools but not students within schools), 2 if the study employed a non-probability-based sampling such as a convenience sample, and 1 if the sampling mechanism was not clearly stated. A similar strategy was followed to assess the research design utilized in a study: a coded value of 4 means all subjects were randomly assigned to groups (e.g., treatment and control), 3 was assigned if the study employed a quasi-experimental design (non-random assignment of subjects to groups), 2 if the study employed a correlational research design (one group of subjects), and 1 if the research design was not clearly stated. Concerning instrumentation, a study was coded 4 if an instrument was international, national, or regional in its origin and purpose because these instruments typically report following test construction standards and demonstrate stronger psychometric evidence. For example, a study using an instrument constructed for an international assessment such as PISA or TIMSS, a national test such as the American College Testing (ACT) assessment, or a state-mandated test was coded 4. A value of 3 was assigned if study-based evidence of strong psychometric properties of an existing instrument or a new instrument developed for a study was reported, 2 if study-based evidence of the psychometric properties of an existing instrument or a new instrument developed for a study were weak, and 1 if psychometric evidence for an instrument was not clearly reported.

A total of 111 studies were reviewed (52 from the AERJ, 59 from IJER). One of the authors did the coding but both authors discussed coding issues in particular studies (e.g., should a study be coded 1 or 2 for research design given the limited information provided) until a consensus was reached. The results in Table 1 indicate that the methodological standards of sampling and research design received minimal attention whereas instrumentation received moderate attention. For studies appearing in *AERJ*, overall 30.8% utilized national or international datasets that employed random sampling and 3.8% employed randomization at the cluster level but non-random sampling at level 1. Non-random sampling was used in 65.4% of the studies reviewed in AERJ, suggesting that generalizing results for these studies is challenging. For research design in the AERJ studies, 7.7% employed RCTs, 25% employed QEDs, and 67.3% employed CDs. Overall 55.8% of AERJ studies used international, national, or state-mandated instruments, approximately one-third of these studies (32.7%) used existing instruments or created instruments showing strong psychometric properties, and 11.5% used newly created instruments but did not report evidence of their psychometric properties.

On the whole, studies appearing in *IJER* showed less evidence of capitalizing on recommended methodological standards. Overall 10.7% of the studies utilized random sampling (most as a result of using PISA or TIMSS data) and 79.7% used non-random sampling. For research design 11.9% employed RCTs, 25.4% employed QEDs, and 62.7% employed CDs. Overall 30.5% of these studies used international or national instruments with evidence of strong psychometric properties, 37.3% used existing instruments or created an instrument for which evidence of strong psychometric properties was reported. Approximately one-third of the studies (32.2%) used existing instruments or created new instruments for which the reported psychometric evidence was weak or not reported at all.

Table 1. Frequency of Articles Employing the Three Methodological Components by Journal and Year (N= 111)

Methodo-logical Components	Journal	American Educational Research Journal						International Journal of Educational Research					
	Year	2016 N= 32		2017 N= 20		Total N= 52		2016 N= 27		2017 N= 32		Total N= 59	
	Code label (Value)	N	%	N	%	N	%	N	%	N	%	N	%
Sampling	Fully random (4)	13	40.63	3	15	16	30.77	2	7.41	4	12.5	6	10.17
	Partially random (3)	2	6.25	---	---	2	3.85	3	11.11	3	9.38	6	10.17
	Non-random (2)	17	53.12	17	85	34	65.38	22	81.48	25	78.12	47	79.66
	Not stated/ unclear (1)	---	---	---	---	---	---	---	---	---	---	---	---
Research Design	Randomized (4)	2	6.25	2	10	4	7.69	2	7.41	5	15.63	7	11.86
	Quasi-experimental (3)	5	15.63	8	40	13	25	9	33.33	6	18.75	15	25.42
	Correlational (2)	25	78.12	10	50	35	67.31	16	59.26	21	65.62	37	62.72
	Unstated/ unclear (1)	---	---	---	---	---	---	---	---	---	---	---	---
Instrumentation	Nat., Int., or SM: SPER (4)	21	65.62	8	40	29	55.77	6	22.22	12	37.5	18	30.51
	Existed or created: SPER (3)	5	15.63	12	60	17	32.69	12	44.45	10	31.25	22	37.29
	Existed or created: WPER (2)	6	18.75	---	---	6	11.54	9	33.33	10	31.25	19	32.20
	Existed or created: Psychometric evidence was not clearly reported (1)	---	---	---	---	---	---	---	---	---	---	---	---

Note. Int.= International, Nat.= National, SM= State-mandated, SPER= Strong psychometric evidence reported

Conclusion

Strengthening inferences of quantitative education studies is a critical goal. The current paper speaks to this goal by providing novice researchers with descriptions of three facets of quantitative methodology (sampling, research design, instrumentation) that may not receive the attention they deserve, along with examples and practical advice that should promote stronger inferences. A review of a sample of U.S. and non U.S. studies provided evidence methodological standards for sampling and research design are under-capitalized. Accordingly, this work should be of value to novice researchers planning to conduct quantitative studies. Audiences for this paper include new faculty, individuals beginning non-faculty roles such as a working in a university-affiliated research center or a government-funded education center, faculty transitioning to more research-oriented work, and graduate students conducting their own research. This paper could also be used for instructional purposes in research methodology classes.

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Relationship between Librarians and Institutional Management: Funding Perspective

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Introduction

A library, mostly an academic library, must be up—to—date, at the same time permit access to resources in its collection. It must provide services and direction to users, as well as healthy spaces and conducive atmosphere in which they can work. In addition, an academic library must house collections that are unique which should be part of the university's and in fact, the nation's legacy (Fowowe, 1988).

Hisle (2011), opined that if we are to make offspring who are autonomous and better to fit into their instant situation and relate well with the globe at large, we need bright, developed and sufficient library services, like knowledge resources centres, media centres, institutional resource centres, and so on. Without any doubt, the degree to which young people and workers of today will be encouraged, learned and educated will be shaped by the limits of the contents of the library materials available within their organizations. A broad collection and abundant supply of resources are required to hearten autonomous study, so that young persons or workers from tender age can learn to reflect so that their poise and views are enhanced as a result of energetic mental efforts.

Functions of Libraries

The major task of an academic library is to offer suitable information resources for study and research to the members of its institution. Also the functions of academic libraries, as posited by Edoka (2000) are as follows:

- To make available information resources that are necessary for the academic programmes of the parent institution.
- To make research information materials available in accordance with the needs of faculty researchers and students
- To present information materials for leisure and for personal and self-development of users.
- To provide study accommodation in a diversity of locations.
- To provide guard and security for these resources
- To co-operate with the other libraries at appropriate levels for improve services.

- To provide specialized information services to appropriate segments of the wider community.

Objectives of the Libraries

It will be necessary to examine the objectives of academic libraries as asserted by Ifidon (2006). These include:

- The recognition of the organization and its purpose. The organization in this case is the institution and its functions.
- The understanding of the requests of the clients and the organization. Again, the patrons are the personnel, students, researchers and outer patrons of academic library while the organization remains the institution.
- The skill to take action and adjust suitably to change in the environment..
- The capability of the organization to refurbish itself so as to be able to handle problems of both expansion and deterioration.
- Enhancement of existing services and modernization of innovative ones.
- The prerequisite of adequate contribution and outputs to guarantee a known quantity in service.
- The development of workers' performance and attitudes as it is through individuals that the work gets done.
- Growth of organization skills and provision of tools and opportunities that allow the organizational managers to do excellent job.
- Creation of discernible, and occasionally, solid results- taking into consideration the objectives of academic libraries which include the provision of information materials to enhance teaching and learning.

Relationship between the Librarian and Parent Institution

According to Dhawan (n.d) the individual in charge of the library must be the library authority, accountable for control and running of the library. He should play a leading role in decision making, should communicate freely among the groups across the organization, and have financial and managerial powers. The library authority' should be reporting to the top management in the organization. There is need to set up a library adversary committee, which, would perform the role of advertising the library on its growth and development. It will also act as a border between the patrons groups,

the administration and between the users group, for ensuring even implementation of the library function and services without compromising policies put out for library growth.

The library is an organization that existed for centuries. In many cases, a parent institution goal determines the library's purpose and functions. The organization where professionals, paraprofessionals and other expert work with a general aim, that is, making information accessible to library users, the professional librarians are the main actors. They ensure that the library is well-funded, has ethics, policy, and procedure for service, while being guided by professional beliefs (Adedoyin, 2006).

Hisle (2011) are of the view that libraries are well-known to gratify the teaching, learning and research needs of the academic society. The education materials in print, audio-visual and electronic formats and good learning situation of the university library make it a place to attain learning skill. It is there to help the parent institution to accomplish its task of education and research.

The responsibility of academic libraries is shifting. They are attempting to lessen their core activities by anchoring their significance with the main activities of the organization they serve, i.e. research and teaching. In the world of internet, the information is readily accessible to the users, thus the libraries are seeking to implant their activities inside academic programs, rather than just partisan or aligning with them, this can be achieved if the parent institution and the librarians have pleasant connection with each other. The relationship between librarians and parent institutions should be seen in terms of teamwork and not divergence. Better and pleasant relationship between the two would help the organization attain its decisive goals, i. e. better and enhanced teaching and research (Chaddha, 2009).

The legitimate relationship between the constitutional bodies in the university on one hand and the university librarian on the other hand has been described with special prominence on the library committee. But the university librarian's working rapport does not end with these groups. Other officers and groups whose work directly involve the operation of the library include the Bursar, The Director of works, the faculty boards and their Deans (Ifidon, 1992). He went further to state that initial budget primed by the library is sent to the Bursar for his recommendation and ultimate collation with those of other departments. The problem of the librarian in assigning priorities to the demands is substantial. To amalgam this problem are aggressive demand from the other department of the university and the socio- economic trends of the country. One of the main persons required to determine these conflicting interests advocate adjustments and give an official permit to budgetary procedure is the Bursar. Although the librarian's original budget estimation may be greatly pruned in the end, the advisory relationship between him and the Bursar could influence the final picture.

Benefit of Improving Librarian and Parent Institution Relations

Since both parent institution and the librarian have general goals, it is beneficial to have an excellent relationship between them. Better relation could lead to healthier and optimal use of the library and its service by the organization. The more they sense good about the library, the more they will persuade the students to use the library and its materials. Improved librarian/parent's institution relations increase the participation of the parent institution in the library, collection development activities and interest of the librarians in teaching, research, instructional design and curriculum development (Chaddha, 2009).

The relationship between librarians and individuals have evolved over time, and how it has taken steps to toughen and buttress the role of librarians and information professionals can revitalise their dealings with users and help build a library that users wish and desire. The healthy relationship between librarian and parent institution will also enjoy exceptional opportunism and librarians will centre on how to advance information services to their patrons (Lachance, 2012).

Funding and Library Resources

Ehigiator (1997) opined that libraries are unprocessed and this is to say that they develop or shrink with time, depending on how much life is infused into them. Fund is required to provide the information needs of the academic library. The academic library is a social service organization that is capital intensive. Fund is essential for building, physical services, books and non-books resources. Journals, employees, overhead cost etc.

According to Fowowe (1988), since the library is the university's vital organ, it follows that it must be appropriately supported monetarily. Ample funding must be considered as basic requirement for the effective development of academic libraries. In this respect, it must be acknowledged that funds are necessary for the resources and services which are provided for library users. Funds are also essential for the workers that retrieve and make accessible the library resources and maintain services. The cost of all these will signify the level of funding required by the library.

If the library is to meet the objectives for which it was established, money is important for the procurement and dispensation of resources, for procurement and preservation of tools. Where finance is missing, it is impracticable to manage library service of any kind and where it is laughable, the effectiveness of that service is bound to be negatively affected. As a result of this, there is need for both librarian and parent institution to work amicably to ensure necessary funds are made available to librarian for the acquisition of information resources and information service delivery to library users(Anafulu. 1997).

The American Library Association (2006) is of the view that libraries of all types need money. The quantity of funds that library receives directly influences the quality of its services. While bulk of funding for libraries comes from state and local sources, federal funding provides vital support, giving libraries across the nation the financial assistance they require to serve their communities. The American Library Association (2006) went further to say that user demands for conventional and new library services have been budding during those decades. Electronic entrance to library resources through the World Wide Web and other networks has improved demands for text delivery each year. Demand for help with access difficulties, position and machinery issues, continue to grow at an exponential speed. The need for training and teaching of users has also grown enormously and continues to do so. Patrons demand for more and better services have resulted in the need for more library employees, improved staff training and development and efficient skill. A new belief of services is rising which centre on library clients, students and faculty and their precise information requests. As higher education goes through rethinking procedure in terms of the learning society and country, libraries and parent institution will need to become more concerned in discerning their new and significant roles in this new setting.

It is extremely necessary for a library to process the materials that will enable it meet its target. Gorgeous building, well qualified employees and new information storage and salvage systems can only be acceptable, if outstanding services are given to users. The librarian must first build up the outline of the library and its parent organization. This can be done by diligently studying the documents relating to the establishment of the library in order to decide:

- The functions of the parent institution and the objectives of its library.
- The patrons to be served and the levels which every group will operate.
- The disciplines that constitutes the main area of attention.
- Immediacy of other library materials
- Amount and constancy of annual book financial support (Odusanya and Osinulu, 2014).

The magnitude of funding in rendering outstanding library services cannot be overemphasized. It is the paste that holds the building, collections and stuck together and allows the library to reach its goals. As such, funds can be well measured as the soul of the library. Laughable funds obstruct the success of any library (Anafulu, 1997). Like water and air, libraries have become an essential and integra1 part of human survival. Frequently called the reminiscence of the human race, libraries are believed to have on

their shelves the records of nearly everything which man has thought, dreamt of and invented. All these demand that, academic libraries should be sufficiently funded by government and parent institution for librarian to be able to carry out these activities as required (Ifidon, 2006).

Problems Militating Against Library Funding

One of the major inconveniences facing academic libraries in Nigeria is insufficient funding. Most academic libraries in the country are owned by higher institutions which are openly funded by the federal or state governments. Most university libraries are allocated 10% of the recurrent yearly budget of their parent institutions. In most cases, this has been noted to be derisory, as it is generally incapable to equip the libraries to the expected standards (David, 2018).

The core source of funding for academic libraries in Nigeria is from government resources and grants. The funding replica, method or level is really dependent on whether the institution is private, state or federal government owned. In general, both states and federal government budgetary requirements/policies and funding allocations to higher education have enhanced library financing and growth (Godwin,2017).

According to Osinulu and Daramola (2017), Federal Government of Nigeria evidently recognizes the vital roles library play in education and research during the provision of information services as suggested by the National Universities Commission (NUC), hence it recommends that a minimum of 10% of each university's recurrent budget be use on the advancement of their libraries. The policy further stipulates that 60% of the allocation be committed to the purchase of books and journals, while 40% is set apart for personal emoluments and procurement of goods and services in the library. The fund is expected to be paid into a different account from the usual university's funds. Nevertheless, it was observed that there was no full conformity with these financial rules. This is clear when it is realized that only2% of the national budget is allocated to education as against 26% recommended by the UNESCO.

Commenting on the underfunding of the educational segment, Inoyo (2014) in his convocation lecture titled "challenges and opportunities for university graduates in a period of economic and ethical decay" decried the pitiable level of funding education in Nigeria. As a country, he noted we are still far off the UNESCO given proposal that 26% of a country's total budget must be devoted to education. He informed that in 2012, N400.15bn or 8.43%, 2013, N426.5bn or 8.7% and in 2014, N495.2bn or 9.9% out of the nation's total budgets respectively was allocated to the education sector in spite of a quantum increase in our gross domestic product (GDP) over the time (67.7billion in 2003 to 522.6 in 2013) representing 672% growth by World Bank statistics. Studies and surveys by scholars have showed that libraries in Nigeria are working in a resource

guarded environment. According to him, libraries in Nigeria do not only lack sufficient funds to acquire books and required journals but that they cannot afford huge amount desired to purchase and maintain computers hardware, build and maintain infrastructure and employ and keep necessary personnel.

David(2018), stated that academic libraries in Nigeria have not been fully able to accept the use of modern technology and ICT. Many of the academic libraries lack the proficiency, personnel and capital required to run a digital library. Only a very few institutions adopted the digital system, consequently a lot more skills need to be done because even the few parent institutions that have adopted the new machinery are strictly constrained by a number of factors such as unpredictable internet services, poor power supply, lack of hardware and software and in most instances poor IT literacy amongst libraries.

According to David (2018) it is deplorable to state that most institutions are generally incapable to meet up with the 10% usually appropriated for the libraries as most universities are facing budget cuts stemming from awful management, poor economic policies and dreadful state of the economy. The subject of poor funding has also made academic libraries incapable to obtain new foreign and home-grown resources (books and journals) that would have helped drive the competence and efficacy of their roles. Funding has constantly been a very great problem to libraries. Libraries cannot on their own produce enough funds sufficient to run their services. They rely on funds allocated from their parents' institution and these funds are almost always insufficient to meet library needs (Godwin,2017).

Conclusion

Adequate funding by institutions of learning should be considered as necessary for the development of library. Apart from the heads of libraries, other faculty members who serve in one capacity or the other in the institutions where they are should join in soliciting for adequate funding for the libraries because they are meant to serve students and faculty members. That enough good books and journals must be purchased and this need to be made known to the parent institution to effect that library services cannot be run with meagre fund. Libraries must turn a new leaf to cope with the trend. The library today must adapt and embrace changes and must be ready to take up opportunities in order to follow the new development in the library world.

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How does Immigration Background Affect Secondary School Performance: The Analysis of OECD-PISA Data in 6 EU Countries

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Introduction

The purpose of the study is to examine the differences in the background characteristics of the students with different individual and/or parental migration experiences and the effects of those differences in their secondary school performances in Belgium, Germany, France, the Netherlands, Sweden and the United Kingdom.

The analysis presented in this conference is a section of my Ph.D. study examining the disparities in employment a nd l abour market conditions an d us e of so cial benefits systems between the native population and the migrants in the host countries.

There have been several criteria in determining the study countries for this PhD. research. They are namely, labour market regulations, welfare state regimes, magnitude and composition of migrants, change in migration policies over time, and availability of the comparable data.

In the literature, scholars have identified various factors, which may be considered as the reasons of differences in the education outcomes between the descendants of the native-born individuals and the migrants. In the first group, there are socio-economic differences (Brinbaum and Kieffer, 2009; Boado, 2008; Leman, 1987, Roosens 1989 and 1988 in Suarez-Orozco, 1991). Education level and other human capital characteristics of the parents; material well-being of the household; environment that the student resides, and like can be given as the examples for such differences. These differences can be regarded as micro and meso level factors. In the second group, there are community effects (Levels, et. al. 2008; Crul and Vermeulen, 2003; Ogbu, 1981 in Suarez-Orozco, 1991), which are also influential in the micro and meso levels. The size of the migrant community; cultural setting/ties of the related community; and tastes, norms, relations with the country of origin are among these effects. Language (Oppenakker and van Damme, 2001; Vedder and Virta, 2005; Schnepf, 2007) is the third major factor resulting in the differences between the children of native and migrant families. The level of proficiency in using the language of the school by the students (Davidheiser and Wolf, 2003) and their parents as well as the frequency of the use of this language in the socio-cultural environment of the students may determine the school performance. Finally, official policies (van Zanten, 1997) are also important in the variation of school success. This category involves various fields like the policies in the education system of the host country

(including the norms for failure, drop out, etc.); and transition between general and vocational oriented programs; and also migration-related policies such as the implementation of restrictive/selective migration policies that determines the composition of the migrants in relation with their human capital characteristics.

In the light of the existing literature and the main purpose of the current PhD. research, two hypotheses are tested in this study. First of them is "*Some of the countries have more effective education systems, which provide better and more equal opportunities for the students with different parental or individual migration experiences." (H1).* In relation to the first hypothesis, the second hypothesis is "*The gaps in the school success in the secondary education are mainly determined by the differences in the socio-economic wellbeing of the students' families and educational and occupational status of their parents" (H2).*

The Data and the Methodology

The study mainly covers the quantitative analysis of 2006, 2009, 2012 and 2015 OECD-PISA Students' micro data sets. The target population of this survey is the children aged 15, who are currently in education. The PISA survey aims at measuring the students' assessments in reading, mathematics and science domains. It collects data mainly in the student level and school level. The survey has been conducted continuously since 2000 with triannual periods. It also has a parents' questionnaire. Apart from the core questionnaire, additional modules on socio-economic and scientific issues have also been used in different waves since the first survey in 2000. The data have a rich set of variables not only for the individual characteristics of the student, but also the socio-economic and cultural characteristics of the student's household and parents. The schools and students for the OECD-PISA are selected by stratified cluster sampling technique. Sample size ranges between around 3,500-4,000 (Iceland and Luxembourg) and 30,000 (Mexico and Canada).

This study includes two sets of analyses. In the first one, descriptive analysis demonstrates the trends in the differences in the background characteristics of the student and their parents as well as the disparities in the school-related characteristics and students' assessments in reading, mathematics and science. In the second set, multiple linear regression models are applied for the multivariate analysis (McClave and Sincich, 1997) to explore the effect of migration background of the student on the secondary school success after controlling the selected parental and school-related characteristics. The SPSS software has been used in the analysis. It should be mentioned that IEA IDBAnalyser has been used in generating some of the SPSS syntaxes as the OECD PISA has a special data structure, which requires additional steps in the calculations.

Deciding the method of using the migration background data in OECD PISA has beenone of the challenges during the study. Although the data on country of birth of the students and their both parents are collected in all the countries, the level of the detail for these variables in the officially published data sets differs across countries. Moreover, although more detailed data are available in some countries, the country of birth information is provided in broader country groupings rather than the single countries. In particular, for the counties analysed in this study, the detailed data are published for Belgium, Germany and the Netherlands, whereas they are not available in France, Sweden and the UK data sets. In this respect, the migration background of the students for the rest of the analyses has been obtained by the combination of the country of birth variables for the students, their mothers and fathers with the broadest categories (i.e. born in the country and foreign-born), which are available in all of these six countries. The preliminary analysis results, which is not presented in this conference, shows that there are negligible differences between the foreign-born and native-born students, whose both parents are native-born. Moreover, the number of observations in the former group of students is too small to provide statistically reliable findings. Therefore, these two groups are merged under the "both parents native-born" category. The other four migration background categories used in the analyses are one parent native/student native-born; both parents migrants/student native-born; one parent native-born/student migrant; and both parents migrants/student migrant (All migrants) respectively.

Descriptive Findings

Socio-demographic and school-related characteristics

As the findings point out, the proportion of the students with two native-born parents decreased over time in Belgium, Sweden, the UK and Germany (with the exception of 2012 in the latter country), while there is no significant change in the share of this group in France and the Netherlands. Besides, native-born students with one native-born parent and native-born students with two migrant parents are two groups with the second or third highest shares in all study countries.

As mentioned above, Belgium, Germany and the Netherlands are the only selected countries with detailed country of birth categories. The descriptive results indicate that they have different migrant groups with various weights in relation with their histories and migration policies. In this respect, it can be argued that the changes in the number, size and composition of the migrant groups bring different socio-economic and education-related challenges in each country.

The data also show that the majority of the families of the foreign-born students with two migrant parents were speaking languages other than the language at school. It is

also the case for native-born students, whose both parents were migrants, all throughout2006-15 period in Sweden, and some years in Belgium and Germany. Moreover, it is observed that a significant increase in the share of students speaking other languages over time in Germany and Sweden, while a decrease in the proportion of this group of students was observed in Belgium.

When the information on the school of the student is examined, it is found that the students with at least one foreign-born parent were less likely to attend ISCED 3A/B programs in Belgium, Germany and France in all years analysed, and in the UK until 2009. On the other hand, the descendants of the migrants in Sweden all over the period and in the UK after 2012 were more likely to attend such schools. The findings suggest that the students with two foreign-born parents are the most disadvantageous groups in attending schools with higher ISCED level.

There are also prominent differences in the education level of the parents between the descendants of the migrants and the native-born population. Students with at least one foreign-born parent were more likely to have parents with low education attainment level (ISCED 0-2) in all countries. This proportion was the highest among the students with two foreign-born parents.

For comparative analysis, the highest parental occupation index (HISEI), which is published in the raw OECD PISA data sets, have been divided in three equal groups according to the students' ranking in this index. Findings show that more than half of the native-born students with two migrant parents were in the lowest 33% HISEI group in all the years in Belgium, Germany, France and the Netherlands, and during the last two years of the period in Sweden. Foreign-born students, whose both parents were also foreign-born, had the similar trend in these countries. On the other hand, the figures indicate that the proportions are similar across students if at least one parent is native-born regardless of the student's country of birth. It is also found that there was less differentiation across migration background categories in the UK relative to other countries.

Home possessions (HOMEPOS) index is a pre-calculated summary index of all household and possession items (OECD, 2014). In the analysis, the percentile groups for this indicator based on the ranking of the actual index scores have been used. The descriptive analysis results show that more than one third of the foreign-born students with two migrant parents were in the lowest percentile of the HOMEPOS index in all years in Belgium, Germany, France, the Netherlands, Sweden, and the first two years of the period in the UK. This proportion exceeded half of the students in this category in the Netherlands and Sweden in some years. It is also found that the native-born students, whose both parents were foreign-born, was the second least advantageous group in terms of home possessions in all selected countries.

The PISA index of economic, social and cultural status (ESCS) is a comprehensive indicator determining the overall socio-economic level of the student's household. The composite score of this index is calculated by the indicators for the highest parental education level, the International Socio-Economic Index of Occupational Status (ISEI), the PISA index of family wealth; the PISA index of home educational resources; and the PISA index of possessions related to "classical" culture in the family home (OECD Glossary). Similar to the analyses of HISEI and HOMEPOS indices, the ESCS scores have been divided in equal deciles for comparative purposes. In the descriptive analysis of this study, the average decile groups for each migration background category are presented. The results highlight that both foreign-born and the native-born students with two migrant parents had much lower positions in the ranking of the ESCS Index relative to the other groups. However, the students with two native-born parents were not always the most advantageous category; the ones with one native-born parent and one migrant parent had higher index values in France, the Netherlands and the UK in the years examined in this study.

Plausible values in reading, mathematics and science

The initial findings demonstrate that having at least one migrant parent significantly reduces the plausible values in all three domains. The ratio relative to the students with two native-born parents was 85% or less for the migrant students, whose both parents were born abroad, in Belgium, Germany, France and Sweden. The ratios of the native-born students with two migrant parents relative to the descendants of the native-born parents were around 90% or less in all the countries but the UK. The ones with one native-born parent had higher averages than the former group of students in all domains. However, their results were still much lower than the students with two native-born parents. In the UK, in all the years, the average plausible values of students with only one native-born parent were equal to the average of the ones in the reference group; otherwise they were significantly higher, in all three domains. On the other hand, the findings indicate that the ratios for the students with two foreign born parents relative to the students, whose both parents were native born, were much lower than 100% in the other study countries.

Multivariate analysis findings

The dependent variables used in the multiple regression models are the natural logarithm of plausible values for reading, mathematics and science. Converting the actual values of the dependent variable into logarithmic values enables the proportional comparison of other categories with the reference category within the independent variables.

Independent variables included in the model are gender; language spoken at home; highest parental education level; 33% HISEI groups; home possessions (HOMEPOS) index percentiles; ISCED 97 program of the school (see UNESCO-UIS, 2006); and the migration background of the student.

According to the R^2 values of the multiple regression models, it can be asserted that the explanatory power of the models for three separate sets of plausible values are similar in each country. Highest R^2 values are for the Netherlands and France, and the lowest are found for Sweden and the UK.

The model coefficients indicate that the girls have much higher plausible values in reading relative to the boys in all countries and in all years. However, this pattern is just the reverse in mathematics and science domains in Belgium, France, the Netherlands and the UK, and to a smaller extent in Germany. On the other hand, there is no statistically significant differentiation between girls and boys in these two domains in Sweden.

Language spoken at home is more influential on the plausible values of the students in Germany and Belgium compared to other four countries. The effect of language at home is observed in particular years in the other countries. Interestingly, the ones speaking other languages at home were more successful in Belgium in 2006. The effect of highest parental educational level is not significant in Belgium while having parents with low educational attainment notably reduces the plausible values in Germany, Sweden and the UK. Likewise, the lower the HISEI index group, the lower the plausible values in all domains. The effect of HISEI is not significant for the medium 33% HISEI group in the Netherlands. The students in the lower ranks of the HOMEPOS index are likely to have lower plausible values. The negative impact was bigger for the ones, who were in the first two lowest 20% groups, though the third and fourth percentiles had lower plausible values to a smaller extend and statistical significance. Being in a lower ISCED level on the one hand and attending a labour market-oriented program on the other hand, result in having lower plausible values. The ratios relative to the ISCED 3A/B is as low as 48% in ISCED 2C schools in the Netherlands and it is below 70% in general in ISCED2A programs in Belgium, France and the UK.

When the coefficients for the migration background categories are examined, it is observed that, most of the gap is eliminated, otherwise reduced after controlling all other socio-economic, parental and school-related differences. Belgium is the only country, where the differences between all migrant groups and the descendants of the native-born parents remain to a big extent, although the disparities found in the actual plausible values between other categories and the reference group significantly reduce in the multiple regression models.

The differences in plausible values in mathematics also remain between the reference category and the native-born students with two migrant parents in France, the Netherlands and Sweden. In science domain, foreign-born students with two migrant parents also have relative disadvantage. The disparities between the descendants of two native-born parents and these two categories are also observed in Germany. Moreover, all other groups had lower mean plausible values in science relative to the reference category in 2015 in this country. The negative impact of having two migrant parents on plausible values in reading is evident in particular years in Germany, France, the Netherlands and Sweden. In the UK, there is no differentiation in plausible values between the descendants of the migrants and the native-born population. On the contrary, native-born students with one native-born parent were likely to have higher plausible values than the reference group in all domains in 2012.

Conclusion

Both descriptive analyses and multiple regression models point out the educational and socio-economic inequalities across the students with different individual and parental migration experiences. The level of success of the students in the secondary school is influenced by the socio-economic and cultural levels of the students' households. The ISCED level and program of the school are among the main determinants. The findings also indicate that there is a relationship between the language at home and success in the school; but not present in all countries and in all years. The proportions of the low skilled jobholders and the less educated individuals among the parents of the students with two migrant parents are much higher than the ones in other migration status categories. These differences have a multiplier effect on the disparities in school success.

According to both descriptive and multivariate analysis results, it can be argued that the students with at least one migrant parent are the least advantageous ones in Belgium. Less inequality in the plausible values is observed across groups in the UK relative to other five countries. These patterns are evident in all years and all plausible value domains. Furthermore, students, whose both parents are migrants, is the most affected group in all the countries. Besides, it can be concluded as the differences across migration background categories are likely to reflect the cumulative effect of the disadvantages in the earlier stages of education. According to the findings of the OECD-PISA data analysis, welfare regimes seem not to be influential to reduce the disparities in educational outcomes. It is also found that the differences between migration background categories are more remarkable in mathematics and science compared to reading. The results do not indicate a significant change in the patterns over time both for the differences between migration background and socio-economic groups.

Based on the analysis results, some future research with more detailed migration background categories can be suggested. This may be fruitful to examine the disparities in the educational outcomes between groups. For this, the availability of comparable and detailed country of origin variables in all countries is the prerequisite in the OECD PISA analysis. Moreover, the analysis for the language proficiency and/or efficiency for the ones speaking the test language at home may provide more consistent results for the effect of language spoken at home. Nevertheless, currently, this information is not available in the OECD-PISA, either. Finally, better sampling designs capturing all ISCED levels/programs and migrant groups in the host countries may enable the researchers to obtain data of the rare groups in the countries.

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Don't Tell Me Fairytales: Disinformatzya, Trolls, Fake News

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Introduction

New technology platforms and communication services on like social media, like Twitter, have altered the way people consume information and how often they share their thoughts on any number of issues. People are habitually more inclined to take a break during work hours by visiting social media sites.

The medium for spreading false information has changed from leaflets, radio, and television to tweets, bot automation, and organized fake Facebook groups (Weedon, Nuland, Stamos, 2017). Technology, particularly social media, has reduced the need to be in physical proximity of the targeted audience and increased the speed and scale messages reach the public. Time, distance, national borders, or even government agencies no longer pose a risk to, nor constrain the agent of deception from targeting a population with propaganda intended to distort the truth (Gu et al., 2017; Woolley & Guilbeault, 2017; Waltzman, 2017). The public is susceptible to deceptively false information when that false information is presented as fact. It becomes more challenging, if not impossible, for the public to discern between sourced based reporting, misleading statements, and disinformation without confirming the sender, the event being reported, and the source of information.

Fake News, or the spreading of false information, is no new phenomenon. Propaganda, misinformation, and disinformation campaigns have long been chronicled as tools of psychological warfare, in order to support of military strategies or undermine political parties, interest groups in numerous countries throughout history (Mull & Wallin, 2013; Black, 2011). Commonly there is a differentiation between mis- and disinformation, suggesting that false information is spread either unknowingly or on purpose, respectively. In today's digital age, where more and more people receive their information online from Social Media platforms, spreading of Fake News and awareness of it is increasing.

Due to the tremendous impact of Fake News on society and increased user awareness on Social Media platforms, the topic has become an interesting and growing research area. Various sub-topics inside the field of Fake News have been formed over the last years. The purpose of this study is to identify controversial events or topics on microblogging platforms, and to discuss the evolution of mis-, dis- and mal-information, fake news or campaigns, trolls, and digital fairy tales and present a descriptive approach regarding

these emerging digital garbage trends.

Background

Information operations, also known as influence operations, have extended beyond traditional vectors, such as radio, newspaper, television programs, and into the cyber domain with the rise of social media and the Internet. Information operations include the dissemination of propaganda to influence a target audience and collection of tactical information about the audience (Waltzman, 2017). The immersion of information operations into the cyber domain, particularly through social media sites, has resulted in a new method of persuading a target audience. Social media democratized information operations because every user can communicate and exponentially more users. In addition, social media can help quantify and measure the scope of influence on an audience and helps conceal the true propaganda authors through bots, fake personas, and sock puppets (Waltzman, 2017; Allcott & Gentzkow, 2017).

The concepts used to sow confusion and divisiveness in public opinion has generally remained the same, but the medium and tactics have changed as social media was introduced to the public. The concept of fake news has been a common term used over the last two years and is synonymous with cyber deception, cyber propaganda, political bots, sock puppets, information warfare, cognitive hacking, and confirmation bias (Gu et al., 2017). Actors have deployed bots or political bots as a new medium to engineer political discussion or push pre-determined topics that would elicit reactions from consumers online (Howard, Kollanyi, & Woolley, 2016).

Propaganda and Information Disorder

Fake news is one aspect of a larger concept to manipulate public opinion called propaganda in information operations. Most people tend to associate negative connotations to the term propaganda and believe the term propaganda has historical connections to oppressive regimes, who are fearful of information sharing, individuality, and the free-flow of ideas (Taylor, 2003). This sentiment reinforces the idea that propaganda is based on lies, deception, and false information, and only non-democratic countries engage in the practice. A general definition of propaganda is a neutral practice of spreading ideas, facts, allegations, or anecdotes for the purpose of persuading an individual or group (Taylor, 2003; Merriam-Webster, 2017). Propaganda itself is neither good nor bad; however, the intentions of propagandists determine the moral and ethical judgment on the information delivered to a target audience.

Propaganda has been leveraged in many both military and civilian domains, including brand management, public relations, and advertising groups, which might promote a product based on consumer's location, gender, and past shopping history (Marwick

& Lewis, 2017). Propaganda, in the context of social media, particularly, Twitter, has increased the exposure of information and provided immediate data on how the information influenced a target audience. Social media has reduced the operations and distribution cost of dissemination information compared to traditional means of diffusing information, such as print media and television (Marwick & Lewis, 2017). In addition, social media algorithms and platforms, such as Twitter, have empowered users to shape online discussions on societal and political issues and events that users believed need more attention. Tweets and retweets propagated information through the Twitter network and allowed users cycle news feed on everyday events as they happened and bypassed the traditional gatekeepers of information, mainly newspapers, editorial boards, and editors (Chamberlain, 2010; Ferrara et al., 2016; Woolley & Guilbeault, 2017; Waltzman, 2017).

Twitter has helped individuals, groups, corporations, and governments to amplify their propaganda on particular issues because of the echo-chamber effect and trending features on Twitter. Followers can respond directly, negatively or positively, or retweet a message to showcase their agreement with a particular point of view. The sender's message aims to trigger critical thought, response, and elicit a change in behavior from its readers while at the same time, promote their original viewpoint. Propaganda aims to compound the recipient's biases with information confirming their pre-determined beliefs. The propaganda message persuades them to react in a manner aligned to the objectives of the propagandist, which is practiced in both the military and civilian industries (Francis 2016; Waltzman, 2017).

Television news still maintains a slight edge over online platforms for how people consume their news (Gottfried and Shearer, 2018). This could increase the amount of misinformation and disinformation to which people are exposed. Wardle and Derakhshan (2017) have looked at the issue of fake news and have suggested the term fails to represent the full issue of distorted information properly and that the term itself has been misrepresented by political leaders and others to fit their agenda and not its original meaning. Wardle and Derakhshan (2017) have come up with the term information disorder, which they suggest better encapsulates the issues involved how information is conveyed to the public. There are three different types of Information Disorder. The different types show how false information is always an issue to the public from being "false to having "intent to harm." Information is power, as is the distortion of that information, as shown in figure 1.

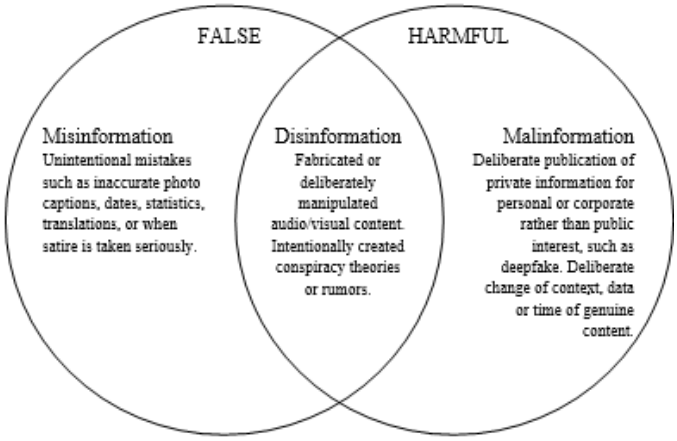

Figure 1. Types of Information Disorder

Information is power as is the distortion of that information. (Wardle & Derakhshan, 2017) Figure 1 shows the differences between disinformation and misinformation, which make up Information Disorder. Both terms share the basic meaning of spreading "false information." The differences between the two terms are whether the spreading of questionable information is done "intentionally or not." Disinformation is when false information is spread on purpose. Misinformation, which was picked as the 2018 word of the year by Dictionary.com, is when false information is spread by mistake. Max de Haldevang further explains that disinformation looks at how others act and misinformation looks at the users themselves. This is mostly because the role of disinformation involves intent and the objective of twisting information to pull over on people where that is not an issue with misinformation. (de Haldevang, 2018). Figure 2 explains the seven forms of information disorder.

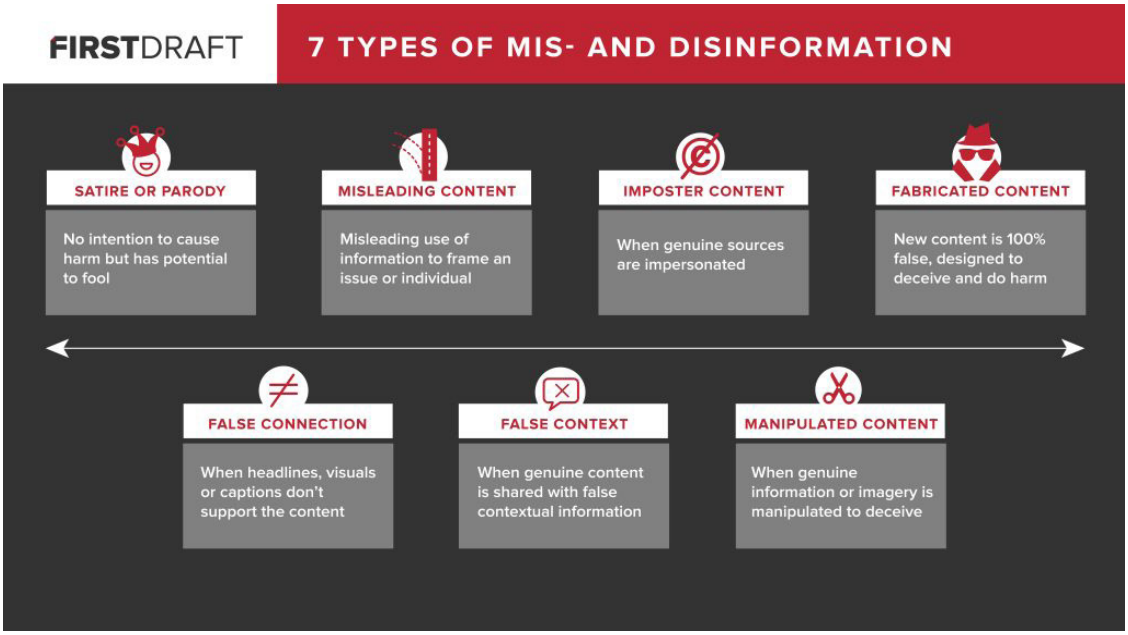

Figure 2. Seven Forms of Information Disorder

Misinformation and Disinformation

Misinformation and disinformation (disinformatzya) are frequently used within the propaganda phenomenon. Misinformation is incorrect information or the act of intentionally misinforming, but displayed in a way that provokes a particular result from the reader, unlike propaganda, which might be based on fact. Ignorance and lack of knowledge are typically the reasons behind a misinformed statement, even though the statement and sender's intention might not be to deceive the reader. Disinformation is a similar concept where false information deliberately spreads, especially when supplied by a government, agent of a government, or third party onto the mainstream news media with the aim of influencing the reader's policies (Desai, Mooney, & Oehrli, 2017; Wardle, 2017). Twitter and other social media platforms are a terrific medium of broadcasting disinformation because senders can cater messages to specific audiences who share common characteristics and interests.

Fake News

Fake news has risen significantly since the 2016 U.S. Presidential Election. The Guardian reported that Collins Dictionary, which reviews billions of words in their "Collins corpus", said that usage of the term, fake news, increased by 365% since 2016 (Flood, 2016). Fake news opens up to the concept of "post-truth," which is defined as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion that appeals to emotion and personal belief" (Wang, 2016).

Fake news can also be defined as fictitious news manipulated to appear as credible news designed to deceive the reader. Fake news should not be confused with satiric headlines, conspiracy theory reports, false statements by politicians, inaccurate reporting, and reports that are misleading, but not outright false (Alcott & Gentzkow, 2017). Misinformation and propaganda are constantly practiced in everyday settings such as advertising, diplomacy, and persuasive literature, yet for the most part, are not intended to deceive the reader deliberately. Some researchers, such as philosopher and ethicist, Sissela Bok, believe that it is more important to unearth the intentions of the sender and if they are trying to deceive the audience (Brennen, 2017). Whether a message is a fact or fiction is merely a byproduct of their intentions and only helps to establish the message's validity (Brennen, 2017). Therefore, one of the main issues with classifying messages as the fake is determining if the sender intentionally manipulated information within a message. Fake news is certainly not a new concept and recently received more attention because of the amount of fake news online that is exacerbated by social media platforms. The social media platforms generated artificial popularity of a fake message that tends to be politically controversial or divisive (Cook et al., 2014; Gottfried & Shearer, 2016; Schreckinger, 2016).

Fake news sites are not only popular in America, but also in various countries such as Turkey. A Turkish guy has inspired from an American fabricated news site theonion.com, and he founded a similar platform in Turkey, called zaytung.com, which is quite popular in Turkey. In the beginning, the founder of Zaytung has begun to write self-fabricated news as a hobby. Today, Zaytung has more than 100,000 authors, increases its income every year, keeps itself on the agenda, and creates an anti-depressant effect against the depressing news. Zaytung differs from other news sites with its content and the way it is presented. At first glance, it seems very difficult to understand whether the news, which seems to be based on a reasonable and genuine basis, are real or imagined, taking into account the rules of news writing in a very serious manner. But as you continue to read the news, a humorous fiction emerges hidden under this serious style. Although this humorous fiction is the result of a creative mind or imagination, it feeds its content significantly from real events and facts.

Fake news has become such a trending topic in the news and social media for several reasons. Today, anyone can research free online tutorials on how to create a message board, or websites for very little overhead cost and generate advertising revenue from the site. Further, the increased use of social media as a source of news and an increase in the number of social media users in 2016 has allowed fake news to spread uninhibited from restrictions or regulation. Since the early 2000s, there has been a steady decline in the trust of media to report accurate and fair news fully, according to Gallup polls (Allcott & Gentzkow, 2017). The decline of trust in their reported trust in the media is sharply different along political party lines. Republicans had a significant drop in 2016 and more apparent compared to Democrats in the polls. Researchers, Allcott and Gentzkow, hypothesized that the decline of trust in the media might be both a cause and byproduct of the popularity of fake news (Allcott and Gentzkow, 2017; Gottfried and Shearer, 2016).

Trolls

Most anecdotal reports on the creators of fake news have surmised that the actors were located in various parts of the world. The multi-national actors contributed to the online feed of false information, for example in the period of presidential election in the U.S. Buzzfeed and the Guardian identified over 100 pro-Trump websites that originated out of Veles, Macedonia, where local teenagers created at least 140 US politics websites (Davies & Silverman, 2016; Silverman & Alexander, 2016; Alcott & Gentzkow, 2017). The political websites mimicked the names of credible news sources, such as USConservativeToday.com, DonaldTrumpNews.co, USADailyPolitics.com, and some of the largest websites had a Facebook presence. The content of these sites was primarily sourced or plagiarized from right-wing sites in the United States (Davies & Silverman, 2016; Silverman & Alexander, 2016). The local Macedonian teenagers

attempted to promote fake news related to pro-Bernie Sanders or leftist opinions. The content posted on these fake news sites related to Trump outperformed by the number of views, shares, and likes in comparison to the opposition, particularly on Facebook (Silverman & Alexander, 2016).

Sometimes the disinformation is shared by trusted media platforms which widen the effect size of the information pollution. A website originated from the U.S., Disinfomedia's most widely shared fake news story posted on an affiliated website, the Denver Guardian, was an article stating that an FBI agent who was tasked with investigating Hillary Clinton's private email server was found dead in an apparent murder-suicide. The story was completely false but shared over half a million times on Facebook alone (Mikkelson, 2016; Sydell, 2016).

Other owners of fake news sites have been unmasked through investigative news reporting. Paul Horner ran a successful fake news website called the National Report for several years. The National Report produced numerous fairytales. The website published a story regarding a 2013 report that President Obama used the money to keep a Muslim museum open during the federal government shutdown. The story became one of the websites most circulated stories (Allcott & Gentzkow, 2017).

Services offering to produce fake news have created new underground marketplaces to manipulate public opinion. Research by TrendMicro security firm identified English-speaking marketplaces for fake news-as-a-service in nation-states such as Russia, China, and parts of the Middle East (Gu et al., 2017). The Russian propaganda model enlisted paid trolls, online users who deliberately attempt to elicit an emotional response from readers, to generate fake news. Trolls diffused fake news through fake accounts on Twitter, Facebook, LiveJournal, and vKontakte, the Russian equivalent to Twitter and Facebook (Paul & Matthews, 2016; Marwick & Lewis, 2017). Trolls were on duty twenty-four hours per day, in twelve-hour shifts, with daily quotas of 135-posted comments of approximately 200 character, according to a former Russian troll (Paul & Matthews, 2016).

A troll or a propagandist spreading false information might be motivated by several factors including financial gain, political or religious ideology and beliefs, and notoriety among online peers (Marwick & Lewis, 2017). The list of factors is not limited to only these few but can include a wide range of motivators. Some propagandists have found fake news propagation offers an incentive because of online advertising's business model that generates short-term revenue for the number of user-clicks to a website. The incentive created a fake news industry that generated news-grabbing headlines on websites. Anyone with some technical knowledge and small financial backing could publish false headlines and narratives that reward the website owner and influences

emotion and behavior responses from readers (Silverman & Alexander, 2016; Tynan, 2016; Sydell, 2016).

In addition, motivating factors differ for propagandists in a civilian and military context. Military propagandists develop series and packages of detailed plans when conducting influence operations that may utilize false narratives. The difference in the military context is that soldiers are motivated by a unified mission which agreed upon a set of parameters to engage a target audience. The military propagandists have an overarching sense of nationalism and patriotism dedicating their efforts towards their belief in a righteous cause. The motivating factors in the civilian context range from personal grievances with a government to conspiracy theorists rallied around a common alternative political ideology (Markwick & Lewis, 2017).

Fact-Checking Networks as a Solution

As the number of fabricated news sites increases, people are taking measures to avoid being fooled. For this reason, there are sites developed in order to confirm the accuracy of the news. Weeks' (2015) online experiment with randomly selected, English-speaking U.S. adults found misinformation corrections were effective, even in the presence of partisan motivations and emotional experiences (Weeks, 2015).

The site teyit.org used in Turkey is one of the fact checking (confirmation) sites serving news confirmation purpose. teyit.org works to ensure that internet users can access the right information by making verifications in many areas from common known mistakes, suspicious information on the agenda of social media, from the claims brought by the media to the agenda. Thus, it enables citizens and non-governmental organizations using the Internet as their primary news source to learn which information is right and which is wrong on the online platforms. teyit.org aims to give the habit of critical thinking and increase the literacy of new media. teyit.org proves that it is impartial in its work, has acted fairly, that its resources, financial structure, and organization are transparent, that its methodology is shared publicly and that it publishes its correction policy. By proving this policy to the independent board of directors and the independent evaluator, it has been entitled to place the IFCN (International Fact-Checking Network) emblem on its site.

Conclusion

Over the past three years, the media and the public have witnessed the impact of a modern-day propaganda campaign designed to exhaust your critical thinking and annihilate to the truth which is known by several terms such as fake news, misinformation, and disinformation. Fake news appears like real news but attempts to twist the facts to not only fit an ideology but also to play on the emotions of the viewers. The term

fake news is the most prolific and generic, all-consuming version of the for-profit and revised-truth phenomenon. Misinformation and disinformation are additional terms frequently used within this phenomenon.

As the term fake news took over the airwaves, some have claimed the term has been overused and no longer retains its original meaning, but is instead better described as information disorder. Originally, fake news distorted real information and made it look like actual news. Over time, that original meaning of fake news has been reframed by those who simply do not like the facts and the issues as a way of casting the news as a hoax, or a conspiracy. The media, perhaps for better or for worse must be mindful of the language they use when reporting on issues. The media creates debate over the implication of untruth and misinformation by parsing the words on the issues which may overshadow the issue of informing the public on the facts.

Misinformation is seen as being out there in the world-anything from rumors to deliberate propaganda to unintentional errors but usually done without looking at the messenger's intent (Illing, 2017). By contrast, disinformation considers the intent of the person, making false claims by attacking the truth. In addition, another new term, information disorder, has slowly gained traction and has been used to explain the overarching concept of manipulated information and the process behind it.

The media's role, at large, has always been to report on stories with verified facts. However, today, outside groups such as the partisan media, political leaders and pundits, and social media celebrities spread fake news to the public on a daily basis. The public is connected, signed on, and checked out to the dangers of what they are hearing and seeing in the media. An uninformed public represents a clear and present danger, not only to the American people but also to the very foundation of its democracy. The danger lies in fake information, potentially "changing people's behavior," specifically the way they think and act on issues and which may reshape the outcome of those issues. For example, fake information could change how you vote in an election and has affected people's views on the safety of vaccines (Illing, 2017).

Fake news did not alter the media landscape but rather heightened a partisan divide already firmly established between mainstream news and opinion media, particularly that is delivered in the format of conservative news. Fake news helps both types of media formats reach their respected audiences but may limit their world view. When Fox News airs fake news and disinformation, they are not providing their viewers with the best information available, but rather merely cherry-picked information that often helps the network but maybe not that of their viewers.

The mainstream media must push back against their conservative counterparts by not just fact-checking their claims but also taking the fight to them and using their methods

to undermine their position with the viewers. The value a network has in reframing news into emotional context is to ensure its viewers stay hooked onto their version of the truth.

For generations to come, the media will hold the factual records documenting the rise and perhaps the fall of fake news. Only after we re-learn to be critical thinkers and appreciate the truth, as it is, will we be able to understand the dangers of the post-truth era fully. It is critical for society to have an informed public and not take for granted the ability to be critical thinkers by questioning information and searching for more answers. Society cannot be ruled by emotions alone nor allow emotions to influence or determine the results and guide society away from the facts. The attack on the truth causes the mainstream media to spend hours setting the record straight, which reduces the time they can report on other stories, which in turn causes the public to be denied information critical to being properly informed and may affect our democracy. In a post-truth world, scientific facts and evidence-based conclusions are allowed to be refuted to fit a narrative rather than reality. The public needs to be made aware that the information they are receiving from those they elected to represent them as well as some within the media itself, are purposefully being manipulated in order to disrupt, distort and attack our democratic norms in an effort to further their own agendas.

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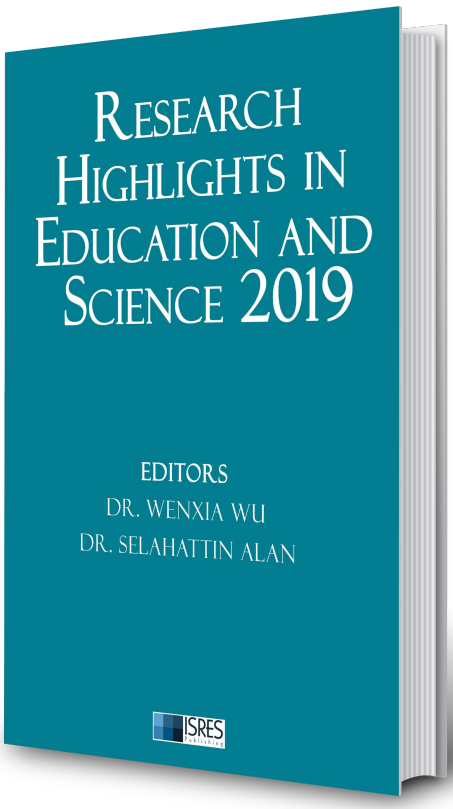

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