Maker Education Challenge in Social Sciences: An Insight From Psychology

Subhan El Hafiz (Universitas Muhammadiyah Prof. Dr. Hamka, Indonesia), Puti Archianti Widiasih (Universitas Muhammadiyah Prof. Dr. Hamka, Indonesia) and Alvin Eryandra (Universitas Muhammadiyah Prof. Dr. Hamka, Indonesia)

Source Title: International Journal of Online Pedagogy and Course Design (IJOPCD) 12(3)
Copyright: © 2022 | Volume: 12 | Issue: 3 | Article: 85 | Pages: 11
ISSN: 2155-6873 | EISSN: 2155-6881 | EISBN13: 9781683182221 | DOI: 10.4018/IJOPCD.304085

Abstract

The present article aims to explain the challenges of maker education in social science, specifically in psychological courses. Three distinctive but inseparable challenges are the products, the professional competencies, and technology. The present articles show that the challenges can be overcome since the barrier is mainly in the back of educators' minds. This paper argues that maker education should be cultivated in psychological courses to enhance meta-competencies, i.e., creativity in problem-solving, and to appreciate a prominent scholar in Psychology who creates a psychological product, i.e., counseling couch, namely Sigmund Freud. Further, a subject of maker education has been applied in psychological courses that show the benefit of making tangible products. The subject, i.e., creative and innovative, has successfully trained students to develop their creativity through making a product to address daily psychological issues. Finally, the course design and the effect on the students were discussed.

INTRODUCTION

Maker Education has been widely discussed in Science, Technology, Engineering, and Mathematics (STEM) Education (Chou, 2018; Godhe, Lilja, & Selwyn, 2019; Halverson & Sheridan, 2014; Martin, 2015). Regarding definition, Martin (2015) define Maker Education as,

> "activities focused on designing, building, modifying, and/or repurposing material objects, for playful or useful ends, oriented toward making a ''product'' of some sort that can be used, interacted with, or demonstrated." (p.31)

Although the definition did not classify Maker Education as exclusively part of STEM Education, it is primarily neglected in social sciences education due to several reasons. Thus, Maker Education is overlooked in social sciences, and the students will not benefit from it.

This article will elaborate on three distinctive but inseparable challenges of Maker Education Education in social sciences that the present paper argues most challenging. First, most social sciences do not create tangible products that enhance students' competencies in the professional field. Second, making tangible products in social sciences is a challenge because most teachers or lecturers consider making competency unnecessary in the professional field. Lastly, in social sciences, the term "technology," which is highly associated with Maker Education, is likely in consonance with the term "user," not "maker."

Although it is not common in social science, Maker Education can be employed. Specifically, the Maker Education Education approach can be applied in a psychological education system. Hence, the present study will elaborate on the challenges of Maker Education in psychological courses. Lastly, this paper will show an implementation of Maker Education in an undergraduate Psychology Department and products that the students made.

BACKGROUND

Regarding Maker Education, educators should refer to the competencies that students should have and be trained. Unfortunately, mainly in social science, no competency in making a product that can be defined as a tangible invention was acknowledged, as shown in psychologist' competencies lists (Fletcher & Maher, 2013; Peterson, Vincent, & Fechter-Leggett, 2011; Rodolfa et al., 2014). In psychology, since it had been widely discussed in 1986, no such competencies of maker were ever mentioned (Peterson, Vincent, & Fechter-Leggett, 2011; Rodolfa et al., 2014). Although the discussion is more about the licensure and seeking standard and general competencies, the maker competency is not explicitly mentioned.

Regrettably, in specific professional fields, no competency to make something is also mentioned. For example, in Sport Psychology, the nearest competency to make is an organizational intervention and educate clients (Fletcher & Maher, 2013) because intervention can use a specific product. For example, games to increase motivation to do physical exercise for the elderly (Brox, Luque, Evertsen, & Hernandez, 2011) or students (Miller et al., 2016). However, the Sport Psychology competencies list does not clearly explain what to make. Besides, in another field, i.e., primary care competencies, no words can represent maker competencies where the product is tangible (McDanie et al., 2014). Thus, when psychologists discuss competencies, it is likely that competency to making something tangible is not relevant.

Nevertheless, Maker Education is not solely about the activity of making. Huang, Lin, and Yueh (2019) argue that Maker Education cultivates creativity in problem-solving. In addition, innovation and creativity are meta-competencies needed in all professional fields (Tubbs & Schulz, 2006). Furthermore, Sopegina, Chapaev, and Simonova (2016) explained three levels of competency maturity: reproductive, partially-productive, and productive. In this regard, creativity is responsible for the highest level of competency maturity, i.e., productive competency. Since creativity is needed in all professional fields, Maker Education should be vital to learn, not only by STEM students but also social sciences students.

Unfortunately, the implementation is not as simple as it is seen. There are obstacles in the social scientist mind and its educational system, especially in Psychology, to implement the Maker Education that make this effort even more challenging. Besides other challenges, which will be discussed below, one of the main challenges is an ethical issue in psychological practices. In this regard, psychology explores various human aspects, such as mind, emotion, and behavior, which is not a solid object and sometimes (or most of the time) fragile, and to test something that involves a psychological aspect can be risky and might be detrimental to well-being. However, not all psychological interventions are clinical, and a simple intervention from a product can be helpful. For example, the effect of music in daily life activities can boost memory and relaxation (Ferreri & Verga, 2019; Linnemann, Ditzen, Strahler, Doerr, & Nater, 2015).

Furthermore, Maker Education should also test the effectiveness of the invented products (Chou, 2018). In this regard, when a new product is tested on humans, it might adversely affect mental health; thus, ethical consideration in psychological testing is essential (Johnson, Elman, Forrest, Robiner, Rodolfa, & Schaffer, 2008). Specifically, if students are not equipped with ethical aspects, testing a product can be an issue.

Therefore, testing a product can be conducted with two approaches. First, a subject on ethics should be delivered to the students before proceeding to the making process. This approach provides a guideline in testing that might affect the respondents' mentality, which they should understand that a high-risk product or high-risk respondents should not be counted in a maker class without prior robust evaluation. Second, the product and the examination method should initially be proposed by students, for example, to their lecturer, before it was created and tested, and the lecturer will decide whether the product can be made and tested.

MAKER EDUCATION CHALLENGE IN PSYCHOLOGICAL EDUCATION

Creating a tangible product

The first obstacle in implement Maker Education in psychology is in the definition of products. Although a more precise definition is needed, in Maker Education, the term "product" primarily refers to a tangible product (Martin, 2015). Meanwhile, psychological products were mainly intangible, such as counseling, therapy, or consultation (Fletcher & Maher, 2013; McDanie et al., 2014; Peterson et al., 2011; Rodolfa et al., 2014). However, psychologists should also recognize that a famous product ever created in psychology is a counseling couch made by Freud and Ferenczi (Obaid, 2018). This couch was created to help Freud and his colleagues to apply psychoanalysis therapeutic techniques. Thus, historically, Maker Education is in psychology.

Unfortunately, most of the discussions in psychology are more about the techniques in counseling, not on the couch, which counseling is classified as intangible. These discussions shape the educational system in psychology, books, and journals. Consequently, the maker and its education system were marginalized in most psychological fields of works.

Nevertheless, the maker traces are not totally lost. In some fields, it flourished. For example, as previously mentioned, music has been studied to help people in daily life activities (Ferreri & Verga, 2019; Linnemann et al., 2015)**,** and also in a clinical setting, such as reducing pain in pediatric therapy (Aitken, Wilson, Coury, & Moursi, 2002) or helps Alzheimer's patients (Ziv, Granot, Hai, Dassa, & Haimov, 2007). Also, in environmental psychology, a made product has been widely studied. For example, it helps design restaurants to gain more consumers (Robson, 1999) and create a nudging to enhance pro-environmental behavior (Byerly et al., 2018). Also, a virtual reality product was created to help self-counseling (Osimo, Pizarro, Spanlang, & Slater, 2015). Thus, Maker Education is in psychology, although it is not embedded in its educational system, and the competencies have not mentioned it explicitly.

The necessity of Maker Education in psychology

The second issue in Maker Education in psychology is related to competencies in professional fields. In this regard, making a product is not the primary competency in psychology, except making psychodiagnostic or psychometric products (Fletcher & Maher, 2013; McDanie et al., 2014; Peterson et al., 2011; Rodolfa et al., 2014), thus currently a maker competency is considered unnecessary except in psychometric. In this regard, psychometric was robustly learned by psychological students, from the theoretical aspect, statistical method, to the testing and implementation (Cook & Beckman, 2006; Klein, 2001).

Psychometric and other tools to diagnose psychological aspects were widely known, and many psychologists have tried to develop a product in psychometric, which can be paper-based, computer-based, or else. Consequently, it has been in the psychological curriculum for such a long time. Nevertheless, skills to make something are not considered a competency that students need to learn; thus, Maker Education is not in the curriculum in most psychological departments.

However, only looking at the maker competencies can be misleading in securing students' benefit from a making process. Maker Education should be seen to train creative competencies in solving problems (Huang et al., 2019), which is needed in all professional fields. Thus, Maker Education should be cultivated in the psychology educational system to enhance the highest maturity level of meta-competencies, i.e., creativity (Sopegina et al., 2016).

Furthermore, it could help solve Do-It-Yourself (DIY) issues and address professional challenges. In this regard, the first counseling couch made by Freud and Ferenczi can be an example (Obaid, 2018). In addition, when Maker Education was brought into psychological education, it was expected that many creative products would be invented to solve future psychological issues. Therefore, bring a perspective that Maker Education will shapes creative competencies in solving problems, no educational system, including social sciences and psychology, should avoid Maker Education induced into the learning system.

Therefore, educators should embrace Maker Education because it enhances creativity in problem-solving, which is needed in all professional fields. In this regard, this paper argues that all educations, including social science, should employ Maker Education. Although creativity can be learned through other means, making can enhance other aspects, such as collaboration, which will lead to more inclusive sciences (Liebenberg et al., 2017; Moustard et al., 2021).

Technology users Vs. Technology makers

The third issue is the term of technology in the back of the psychologist's mind. In psychological competencies, the word "technology" is mainly placed after the word "uses" or followed by the word "user." For example, McDanie et al. (2014) propose competencies that explicitly mention psychologist as a technology user, such as "Effectively uses information technology to track patient outcomes and provide a means for program evaluation" (p. 416), and

"Uses most up-to-date technology and methods to guide clinical service delivery" (p. 420). Thus, the expected competencies tend to shape students as "users" than "makers" of technology.

However, the perspective should be changed because creating technology is a responsibility from all fields, which technology is an artifact produced by an interaction between scientists, inventors, and various public forces (Kranzberg, 1991). For example, a primitive tribe in Congo has participated in CyberTracker Technology development to help health authorities overcome the Ebola outbreak before attacking humans (Liebenberg et al., 2017). Thus, as part of the public, psychologists are also responsible for shaping and developing technology.

Besides Freud's counseling chair, in psychology, simple technology has been created to help people, such as music choice programs and pictorial instruction programs, which can help patients with moderate Alzheimer's illness (Lancioni et al., 2014). Of course, the product and its technology are not exclusively made by psychologists, but they should collaborate with various people with various backgrounds, which collaboration is one of the central topics in Maker Education (Martin, 2015). Therefore, through Maker Education, psychology can also be part of technology creation and invention, and inducing it in the psychological curriculum will help the psychologist participate in technology creation and deal with future challenges.

METHOD

Maker Education in a psychological course

Amongst a few, an undergraduate psychological department already implements Maker Education in its curriculum as one of its subjects, i.e., Undergraduate Psychology Department in Universitas Muhammadiyah Prof. DR. Hamka (UHAMKA), Jakarta. This section will discuss Maker Education in psychology courses, precisely the expected competencies and learning process from the psychology course, and the course is called "Creative and Innovative."

Expected competencies and learning processes

The purpose of the course was to train students to create a product that can overcome non-clinical daily issues in psychology. In order to achieve this competency, students were required to develop and enhance three domains (i.e., cognitive, skill or behavior, and attitude). First, students were required to comprehend the cognitive aspect of creativity theories, including the definition, the creativity phases, and the brainstorming concept. Next, in the skill or behavior domain, the students were trained to define a psychological issue to be solved. Further, students are also trained to design and make a product to address the issue, test it, and explain its benefits through a presentation. Lastly, in the attitude domain, the course was made to develop the students' creative attitude and collaborative attitude. In short, the expected competencies are supported by abilities in the three educational domains, cognitive, attitude, and behavior or skill.

As for the learning process, the course is delivered with four credit hours, equating to 200 minutes per week in the classroom or 400 minutes per week for non-classroom activities. The learning process is conveyed through four stages and follows with an evaluation stage. These stages are delivered in sixteen weeks of learning.

Stage One: Discussing creativity theories.

In this stage, most of the activities are learn and discuss the creativity theories in the classroom. Amongst many, students only learn a few theories of creativity, which is applicable because they will be asked to implement the theory in themselves and their groups' activities. Specifically, students were asked to learn about brainstorming and practice it in their group. Through this process, students are expected to comprehend the theories, enhance the ability to apply the theory, and further feel how the theory works.

Stage Two: To define daily psychological issues and solutions.

In this stage, each group of students was summoned to discuss and define psychological issues, which their group wants to address. Before proceeding to the solution, the students must receive approval from the lecturer whether the issue is non-clinical and feasible to address. After the approval, the groups should discuss an idea of a product to address the issue, which each group should employ the creativity approach before coming up with a final idea.

Although most activities are group discussion and group work, the lecturer initially explains and discuss ethical aspects and psychology perspective to view an issue. These explanations will be a guideline to decide the issue to address and a product to create. To ensure the creativity theory is applied, students were asked to report their creative process.

Stage Three: Making a prototype.

Create a prototype is a combination of students' skills in each group. Typically, each student in each group will have different skills and can support each other skills. For example, one student might be good at design, the other better at computer skills. Hence, students are expected to acknowledge the need for collaboration because they will feel that someone cannot solely make a product. However, sometimes, groups need help from outsiders to make a product that the groups have designed.

Before students create any product, again, each group should create a design and propose it to the lecturer. The prototype can be made if only the design is not harming, either physically or mentally, or both. Thus, the students and the lecturer must ensure the product's safety before continuing to the next stage.

Stage Four: Testing the product and reporting.

Before students examine the effectiveness of the made product, the students were taught an experimental design. The concepts were needed to conclude whether their product effectively

addresses the issue. Since it is only a learning process, the research design does not have to be robustly made. A simple experimental design with a simple technique to measure the effectiveness of the product is enough. It is expected that the students will learn about the product's effectiveness through this process, not only a making process.

Finally, students were asked to write a report. Every work should be archived; thus, others can learn from the process taken. In this course, reporting is not only to communicate findings but also to evaluate the learning process. Therefore, a specific report format is one of the tools in the learning process from this subject; for example, the report should mention the previous mistake they already made in the making process.

Stage Five: Evaluation of the learning process.

Eventually, all students should be evaluated. The evaluation is made to evaluate all aspects of the competency dimensions expected. Since the venture was a group project, the evaluation process was also made to differentiate members' participation in the group work. In this regard, several techniques were used in the evaluation process, quiz, presentation, report, observation, and interview. However, the observation cannot currently be conducted due to the Covid-19 outbreak, but an interview can substitute it. In addition, each of these techniques was used to evaluate particulars domains of competency.

The quiz aims to evaluate students' comprehension of the creativity theories, which is a cognitive domain. Since creativity is highly related to psychological theory, evaluating the comprehension of the theory is highly related to the psychological field, practically and theoretically. Further, through a good understanding of the theory, it can be expected that students can apply the theory in other cases. Thus, to pass the course grade, students must meet the minimum requirement of theory comprehension, which is not lower than moderate.

As for the skill or behavior domain, the evaluation techniques are presentation, report, and interview. A lecturer can evaluate the creative process that each student showed while designing and making the product through a presentation and a report. While through an interview, the differentiation of the creativity from each student can be evaluated. Besides, the interview will reveal the collaboration and check each student's contribution in the process.

Lastly, for the attitude domain, an interview is used to find out the creative attitude of the students. Students were asked to reflect on their experience in making a product in the interview session, and a lecturer can evaluate their creative attitude. One of the questions is to mention other ideas that pop up in the students' minds about creating a product. If students can mention more new ideas besides their project, their attitudes can be judged highly creative.

RESULT

The products of Maker Education in a psychological course

Each class has about six to ten groups, and each group consists of 3-4 students which each group creates a product. Although all groups can finally make a product, not all products are aligned with the stated issues. The failure mainly relates to cooperation and leadership aspects in the group, in which groups with a lack of leadership and cooperation skills tend to fail to make a good quality product. In this regard, a product seems too simple without a considerable creative idea add-on. However, in the interview session, students acknowledge they are deficient in interpersonal communication and cooperation, which the benefit of the failure will be discussed below, but first, the successful products (see Figure 1).

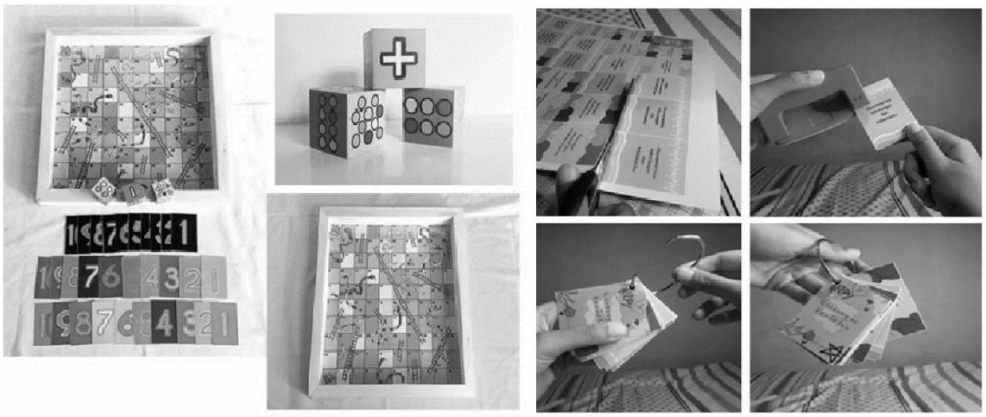

Figure 1. Math Dice (left group); The making a "Quote Card" (right group)

The two first products were considered as successful products. The first product's (left figures) purpose is to motivate elementary school students to learn math. The product is called "Math Dice" because the central creativity aspects are in the dice. It is a traditional game of The Ladder and The Snack which the group adds their creative idea in the dice. Three dices were used in this game; two of them have a certain number of dots, and one dice has a plus (+) and a minus (-) sign. After each time the dices were rolled, children should count the dots and sum or subtract them accordingly before moving.

Compared to other products, the idea from this product is motivation in learning math. Since some children love playing more than learning, particularly in math, it is expected that children will learn math with a happy feeling by combining the game with the math activity. Thus, the group expects children enthusiastic about the game, eventually increase math skills.

During the interview, students explain a better collaboration through the making process and felt more attachment with children when testing the product. Besides, they feel excited that a simple idea helps others, specifically the children who play with their product. Also, students explain that they need help from a carpenter in the making process and express better appreciation for the carpenter's skill because not all carpenters they met can make the product.

Next, the second product was simple (right figures), which a group of students aim to support people who feel down through motivational quotes. The students utilize a chain to combine all motivational quotes, which some of the quotes are made by them. The product is expected to be placed in a spot where the person can read it at any time. In this making process, the students explain that they are not only learning about cutting, but they are also learning about design and creating quotes. These competencies complement the main expected competencies, i.e., creativity in solving daily psychological issues.

Meanwhile, Figure 2 shows a product from groups that have communication and leadership issues. The left picture shows a product from a group with poor leadership, which the product is an activity toy to help children enhance their motor skills. The students explain that the product was made twice bigger than expected because one student does not want to follow the previous design. Although the group faces poor leadership, the group successfully made the product and tested it on children. During an interview, students acknowledge that in group activities, collaboration and good communication are highly needed. Furthermore, students explain that they are forced to adapt to a challenging situation affected by leadership issues. However, students are happy when the product was successfully made and tested.

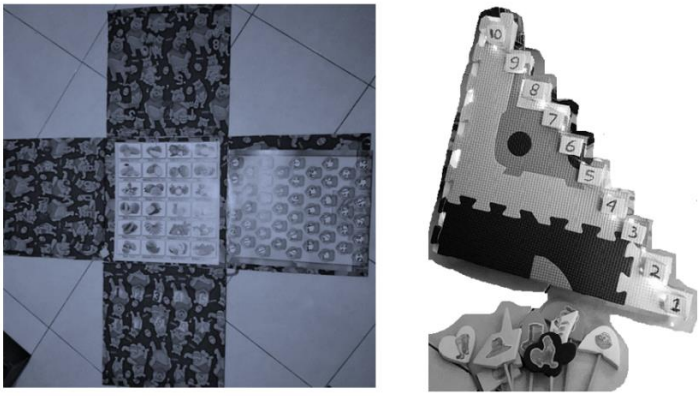

Figure 2. Motoric Education (left); Math Stair (right)

Lastly, the right Figure shows a product to help children understand math, named “Math Stair.” Besides leadership, the issue in the group was nonparticipation by two students who did not significantly contribute to the making process. During the brainstorming phase, the students are not offering any ideas to help the brainstorming process. The nonparticipation students argue that they are not creative, which this perception made them unconfidently participate in the group activities. Unfortunately, the other members cannot encourage the students to express their ideas freely and actively participate in the group. Although the product was made, the nonparticipation students did not feel more creative at the end of the session.

DISCUSSION

Although most of the discussions in Maker Education are on STEM education (see Chou, 2018; Godhe, Lilja, & Selwyn, 2019; Halverson & Sheridan, 2014; Martin, 2015), the present study shows that in social sciences education, particularly psychology, it also be beneficial and can be applied. There are several challenges in the psychological education system to induce maker Education, and most of the challenges are related to the expected competencies in professional fields, yet Maker Education should not be overlooked.

However, the debates on psychologist competencies mainly focus on licensure (Peterson et al., 2011; Rodolfa et al., 2014), while no licensure is needed to make something. Moreover, Maker Education helps students develop a meta-competency, i.e., creativity in problem-solving, which is needed in all fields, formal or informal (Sopegina et al., 2016; Tubbs & Schulz, 2006). Therefore, although professional competencies were not explicitly mentioned the making competency, it should not overlook a Maker Education.

Furthermore, the course that applied Maker Education in psychology shows that all groups had accomplished the maker challenge, though some groups face some issues while

conducting their project. Tangible products have been created, although the product is not entirely genuine from their idea. Regarding meta-competency, i.e., reproductive, partly-productive, and productive (Sopegina et al., 2016), most products can be classified partly-productive because, in most products, they only add their idea to an existing product.

Although the products made is not represent the highest level of meta-competency, during an interview in an evaluation session, most students explain that they learned to address other issues using the creative process. Further, some students can mention other ideas that pop up in their minds to address daily psychological issues. In addition, students' self-confidence was boosted to learn new things, such as design and crafting, and enhance DIY ability.

Although some groups demonstrate poor communication and leadership, groups' members recognized the issue and tried to overcome it. Martin (2015) explains that Maker Education should also celebrate the failure in the making process. In this regard, group members can appreciate the learning process through a trial-and-error process regarding the product and the group activities. Therefore, students learn not only from their success but also from failures.

In the evaluation system, the multi-modals of the evaluation system can acknowledge the differences between students in the same groups. Specifically, an interview can recognize whether students actively participate in the making process or become a nonparticipant. Also, the evaluation system can recognize other soft skills enhanced, such as leadership and communication skills.

Finally, a well-managed learning process of Maker Education can be delivered to undergraduate students in a psychology department. In particular, the course was designed to teach and train various domains of creativity of the students, i.e., cognitive, to comprehend the theory of creativity; skill or behavior, to train the maker skill and collaboration skill; and attitude,

to shape the creative and collaborative mindset in problem-solving. Through this learning process, it can be expected that students learn to address unexpected issues in the future with a creative approach, either by creating tangible products or non-tangible products.

CONCLUSION

As demonstrated in the learning process, Maker Education can be applied in the undergraduate psychological department. Further, Maker Education is beneficial for students that enhance meta-competencies, i.e., creativity in problem-solving. Thus, Maker Education should be employed in all educational fields, not only STEM (or STEAM when including Art).

There are three distinctive but inseparable challenges to deliver Maker Education in social sciences, i.e., to make tangible products, professional competency, and technology. In overcoming the challenge, essential to be noted that psychology can make tangible products, Maker Education should focus on meta-competency, i.e., creativity in solving problems, and the psychology community should contribute to technology development.

Although meta-competency can also be improved through various learning processes, in psychology, Maker Education should be embraced to appreciate previous scholars' efforts, such as Freud, when inventing the first counseling couch. Also, current studies have shown the contribution of psychology in the making of various tangible products. Thus, it is advantageous to implement Maker Education in the psychological education system.

LIMITATION

Although the present study shows the benefits of Maker Education in psychology, some limitations should be acknowledged. First, no study has been conducted to show the long-term impact of the course, which more research is needed to uncover the impact. Second, relate to the course, collaboration has rarely been shown with students from other educational backgrounds,

and Maker Education should have a better learning outcome when students besides psychology have participated. In this regard, a more detailed learning process design is needed to ensure all students will receive equal benefits from the course when it inclusively invites students outside psychology. Third, in the present study, the data is taken from the evaluation stage; thus, more robust measurement is needed to evaluate effectiveness in Maker Education. Lastly, psychology might not represent all social sciences; however, it is expected that all sciences can gain insight from the course to improve students' meta-competencies through Maker Education.

ACKNOWLEDGMENT

We thank the students who permitted us to use their product pictures in this paper, but we cannot mention their names because some groups might not feel comfortable that this paper mentions them.