

## Improvement of Problem-Solving Skills: Soft-Skill Education Based on Information Technology for Adolescence

<sup>1</sup>Hera Heru Sri Suryanti, , <sup>2</sup>Ferisa Prasetyaning Utami  
<sup>1,2</sup>*Faculty of Teacher Training and Education, Slamet Riyadi University*

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**ABSTRACT :** Problem-solving skills are the capital for teenagers to achieve their goals. The research objective is to improve problem-solving skills through information technology-based soft skills education for adolescents. This research is a true experiment with Pretest-post-test Control Group Design. The selection of subjects used purposive sampling technique. Data collection techniques use questionnaire instruments used to measure problem-solving abilities in adolescents. Thirty students were identified as having low problem-solving skills. The 30 students who had low problem-solving skills were divided into two groups: the experimental group (n=15) and the control group (n=15). Hypothesis testing in this study used non-parametric statistical analysis consisting of the Wilcoxon Signed Rank Test and the Mann Whitney U Test. In the results in the experimental group, there was an increase in scores, while in the control group the score tended to be relatively fixed. This proves that soft skills education based on Information Technology can improve adolescent problem-solving skills. This research has implications for the formal development of soft-skill services at the university through the provision of a Technical Guidance and Counselling Service Unit to ensure the psychological life of students.

**KEYWORDS:** education, information technology, problem-solving.

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### I. INTRODUCTION

Problem-solving skills are abilities that teenagers must-have. Teenagers who are skilled at solving problems will smoothly carry out daily activities. Problems faced by adolescents include personal problems and social problems. Learning behavior as strategies, approaches, and habits that children have demonstrated while working on tasks, that encourage learning (Allsop, 2019). Teach design thinking to students as a skill to prepare students for problem-solving in complex environments (McLaughlin et al., 2019). In a rapidly changing world, individuals need to benefit from developing a variety of personal and social skills. Such as leadership, prosocial behavior, interpersonal, problem solving skills, and responsibility (Opstoel et al., 2020). The higher the level of education of the individual, the less experience and social conflict compared to individuals with a lower level of education (Alčiauskaitė & Šinkariova, 2018).

Soft skills education is an education in the affective aspect that needs to be given to adolescents. With changing educational trends, flexibility in education outside of school much-qualified personnel, competition for job acquisition, and job sustainability are becoming increasingly challenging. For today's labor market the workplace is resizing and reducing positions, it is evident that professional skills alone are not enough to keep individuals working. To gain an advantage over competitors, applicants in addition to adding advantages to their hard skills develop potential through soft skills (Qizi, 2020). Participating students showed statistically significant improvements in financial literacy knowledge, and students' perceptions of their soft skills gain also improved. The increase in students' knowledge was found to be related to prior knowledge, work experience, type of school they attended, perceived skill acquisition, and intention to incorporate the training into their daily life (Lopus et al., 2019). The classification of graduate soft skills, which varies, can provide insightful information to college stakeholders. To produce work-ready graduates, higher education institutions need to reevaluate their teaching and learning approach to develop the necessary graduate soft skills as needed of the job market (Hanim Md Pazil & Che Razak, 2019). Information technology is a medium to facilitate the delivery of material in learning. An alternative to the application is to build it on a device closer to the data node. Industry 4.0 elements such as big data, the Internet of Things, and smart factories have a positive role to play in driving the implementation of information technology (IT) that contributes to sustainable business performance. In addition, organizational structures and processes strengthen positive relationships between Industry 4.0 (Haseeb et al., 2019). Information management research should better recognize children's daily lives, which are digitized, and their basic education as significant areas of concern. We understand them to shape education in the context of higher education, but we need to influence the basic ability of the younger generation to equip them with skills and competencies.

In this digital age will arouse their interest in various career options (Ivari et al., 2020). There are reasons why the impact of ICTs on growth in developing countries differs from that of developed countries (Niebel, 2018). Soft skills education can improve problem-solving skills. Unlike traditional teaching, based on a typical lecture-exam structure, they often go beyond focusing on specific science skills (Gadola & Chindamo, 2019). Some hard skills and professional competencies are increasingly inadequate (Raitskaya & Tikhonova, 2019). Characteristics objectively: professional status of university graduates (job share, wage level, field of work), educational status (social and professional), accreditation and characteristics including formation, professional competence (including hard skills and soft skills), which together characterize their professional subjectivity (A. G. et al., 2019). The debate about the breadth of the concept of individual soft skills has emerged. There is little doubt about the need for these skills to be developed, eg insufficient conception is sufficient for success (Santos Rego et al., 2021). Therefore, college graduates are not only professional in their work, but also need to have soft skills, namely the ability to communicate, coordinate, work under pressure, and solve problems (Qizi, 2020).

Adolescence is a transition period from childhood to adulthood with an age range between 12-22 years, during which time there is a process of maturation both physical, psychic, and social maturation. The developmental trajectory of social status and social behavior in early childhood and adolescence predicts the involvement of their bullying participants' role in adolescence (Pouwels et al., 2018). Common perceptions of gender norms about romantic engagement in early adolescence, normative for both sexes, but socially valued for boys while not valued for girls (Moreau et al., 2019). But on the ground the conditions are different. There are still teenagers who don't have problem-solving skills yet. Based on interviews with some students at the end of the midterms. Semester I students encounter learning difficulties due to the transition from High School to College. The difficulty is mainly in doing group tasks with online systems.

Soft skills education is an effective aspect that needs to be given to adolescents, not yet effective implementation. The results of observations in the 2021 semester, in the College of Soft Skills Education, have not received a decent place. The tendency of the implementation of learning is dominant to achieve the goals of cognitive aspects. Achievement of effective aspect objectives is included in certain courses, such as Religion, Pancasila, and Citizenship. In practice, the course is also dominated by cognitive aspects and moral values (Zabidi et al., 2020). There are still teachers who are reluctant to use information technology as a medium in learning. Based on interviews with teachers who lack it, there are still teachers who are less interested in using information technology in learning. Teachers only use books as references without using learning media so it is not interesting.

Soft skills education has not been effective in improving problem-solving skills. Based on counseling interviews in the 2021 semester at the College there are still many students who are soft skills low. Students put their egos and emotions first in overcoming problems. Many obstacles in the process of maturation of adolescents are physical, psychic, and social maturation. Based on observations in the even semester 2020 there are still first-semester students who have maladjustment behavior caused by their peers. Semester I students still have a high ego can not work well together maybe because they have not known for a long time. Based on the description above, research is needed to be done on improving adolescent problem-solving skills through soft skills education based on information technology. There is still rare research on soft skills education based on information technology. Most in educational institutions soft skills are included in character education, such as the results of the following studies. Evaluation of how FDD is carried out in accordance with Service-Learning (SL) principles can help in acquiring "soft skills" and how this can promote knowledge and achieve sustainable development goals (SDGs) (Hernández-Barco et al., 2020). Teenagers who work collaboratively in teams can improve critical and creative thinking. For example, focuses on software engineering skills and management skills, including the ability to communicate effectively, work in teams, think critically and creatively, and manage projects efficiently with realistic boundaries and standards (Khandakar et al., 2020). Student participation in competitions has a positive impact on students' soft skills (social skills and motivation) and learning achievement (Dziob et al., 2020). Children have specific narratives about education.

## **II. METHOD**

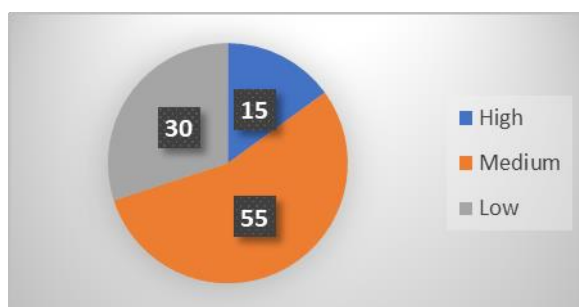
This research is a true experiment with Pretest-post test Control Group Design (Cohen, 2007). This design uses two groups: the experimental group and the control group. The selection of research design is based on the fact that subject selection is not random but uses purposive sampling for experimental groups and control groups. Both groups had the same situation, but the experimental group was given intervention in the form of information technology-based soft skills education strategy, while the control group was not given special

treatment from researchers, but was assumed to have followed a program of guidance and counseling services provided by counselors as usual.

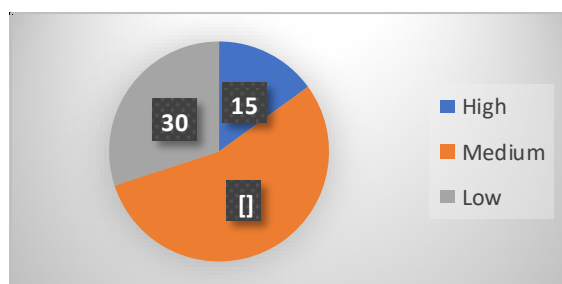
Samples	The beginning Condition	The Treatment	The End Condition
The experiment group	O <sub>1</sub>	X	O <sub>2</sub>
The Control Group	O <sub>3</sub>		O <sub>4</sub>

**Fig. 1. The pretest posttest control group design**

The data collection technique in this study is an instrument used to measure problem-solving abilities in adolescents. Indicators used in the preparation of the problem-solving ability questionnaire instrument, namely (1) the assessment of problem-solving skills personally; (2) define problems and



formulate them, (3) generalize alternative solutions, (4) make decisions, and (5) implement solutions and verifications. Based on preliminary pre-test results from 100 students, it is known that 30 students were identified as having low problem-solving skills. The 30 students who have problem-solving skills Low are



divided into two groups experimental group (n=15) and the control group (n=15).

**Fig.2. Profile of Problem-Solving Skill**

The data analysis in this study was to use a table of problem-solving skill criteria to categorize students' problem-solving abilities in the time before and after the intervention.

**Table 1. Criteria for Problem-Solving Skills**

Interval	Criteria
81,25 < score ≤ 100	Very good
62,5 < score ≤ 81,25	Good
43,75 < score ≤ 62,5	Enough
25 ≤ score ≤ 43,75	Less

The data analysis technique used the Wilcoxon Signed Rank test and the Mann Whitney U Test

### III. RESULTS

Pretest results as an initial profile of a student's problem-solving abilities.

**Table 2. Pre-Test Results About The Problem-Solving Ability**

ect	Subj Group	Experiement Group	Control Group
	AS	40	41
	GJ	43	35
	KL	35	43
	WE	32	32
	TH	33	33
	LI	40	41
	SS	41	41
	BN	42	42
	MK	30	31
	WR	29	29
	F	26	26
	QQ	28	27
	QT	28	28
	OP	40	39
	RA	41	40
	<b>AVE</b>	<b>35,2</b>	<b>35,2</b>
<b>RAGE</b>			

Based on the results of pre-tests both groups can be known the average of both groups amounted to 35.2 for the experimental group and 35.2 for the control group. The results showed that the average problem-solving ability of adolescents in both groups belonged to the low category.

**Table 3. Post-test results about the problem-solving ability**

ct	Subje Group	Experiment Group	Control Group
	AS	65	41
	GJ	71	35
	KL	72	43
	WE	80	33
	TH	77	35
	LI	75	43
	SS	77	41
	BN	60	42
	MK	70	31
	WR	70	29
	F	71	30
	QQ	70	30
	QT	65	31
	OP	70	39
	RA	75	42
	<b>AVE</b>	<b>71,2</b>	<b>36,3</b>
<b>RAGE</b>			

Based on the post-test results of both groups, the average of both groups was 71.2 for the experimental group and 36.5 for the control group. The results showed that the average adolescent problem-solving ability in the experimental group was classified as "Very Good". While in the control group classified as "Less"

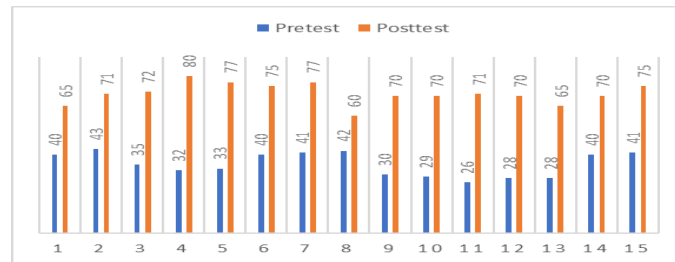


Fig.3. Results of Pre-Test And Post-Test Scores In The Experiment Group

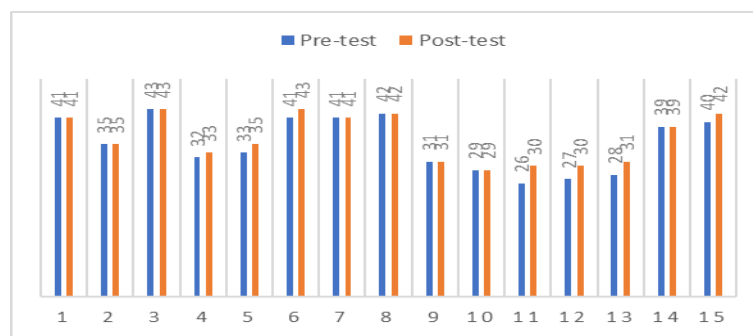


Fig.4. Results of Pre-test and Post-Test scores in the control group

Looking at the two charts above, it can be concluded that in the experimental group there was an increase in scores, while in the control group the score tended to be relatively fixed.

Table 4. Hypothesis Testing Results Through Wilcoxon Signed Rank Test Analysis

Group	Z	Asymp. Sig. (2-tailed)
Experimental	-3,408	0,001
Control	-2,388	0,017

Based on the test results of the two groups using the Wilcoxon Signed Rank-test, it shows that there is a difference in the value of Asymp.Sig (2 -tailed). In the experimental group the value of Asymp.Sig (2-tailed) showed 0.001. This means that there is a change in the subject's problem-solving ability after being given a problem-solving strategy treatment, this is due to the value of sig 0.001 <0.05, it can be concluded that Ha (Alternative Hypothesis) is accepted.

Table 5. Analysis of the Mann-Whitney U Test on the post-test scores of the Experiment and Control Group

Test Statistics <sup>a</sup>					
Mann-Whitney U	on W	Wilcox	Z	Asymp . Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]
.000	0	120.00	-	.000	.000 <sup>b</sup>

a. Grouping Variable: metode

b. Not corrected for ties.

Based on the results of the post-test test of the experimental group and the control group with the Mann Whitney U Test, the Asym.Sid (2-tailed) value was less than 0.05, then  $0.000 < 0.05$  the alternative hypothesis was accepted. So that there is a significant difference between the post-test scores of the experimental group and the control group due to the intervention in the experimental group. It is concluded that soft skills education is effective in improving student problem solving skills.

#### **IV. DISCUSSION**

There are still teenagers who do not have problem solving skills. Assessing student skills requires an assessment tool that can be used to assess complex collaborative problem solving skills (Grohs et al., 2018). Problem solving skills are considered as an important component in learning learning for beginners. Games help most students in understanding programming concepts, structures, and problem solving strategies (MATHEW et al., 2019). Learning that involves collaboration and interaction through a constructivist learning environment and integrative pedagogy develops learning skills, develops decision-making skills, creativity, and problem solving skills. In contrast, traditional forms of teaching – such as reading, lecturing, and entrepreneurship – are less likely to develop general skills (Virtanen & Tynjälä, 2019). Adolescents who grew up in a technology-rich environment, both in school and outside, and an interest in working in an increasingly complete school where technological innovation is increasingly valued. Problem solving in another context is in mathematics, namely the resolution of situations that are considered a problem by the person who solves it. Thus a situation is a problem for a person if he is aware of the problem in the situation, knows that the problem must be solved, is interested in solving it, but is not necessarily solved (Rohmah & Sutiarso, 2017). The need to develop problem-solving competencies is increasingly emphasized by the ever-evolving nature of society, students need to be equipped to negotiate (Buckley et al., 2019). One of the supporting activities in problem solving is Educational robotics (ER). ER is increasingly being used in the classroom to implement activities that encourage the development of students' computational thinking (CT) skills. However, it is still rare to discuss how to apply ER activities to the development of CT skills in the classroom (Chevalier et al., 2020).

Soft skills education is one aspect of effective education that needs to be given to adolescents but has not been effective in its implementation. A wide range of skills and knowledge are important for youth employment, namely “soft skills” and personal characteristics, such as communication skills and the ability to develop interpersonal relationships. Hard skills in adolescents regarding mastery of certain field competencies are also important but need to be balanced with soft skills ownership (Federer, 2018). The relationship of the characteristics of Generation Z that is most highlighted is project management soft skills (Magano et al., 2020). Increased students' financial literacy knowledge was found to relate to previous knowledge, work experience, the type of school they attended, the acquisition of perceived soft skills, and the intention to incorporate training into their daily lives (Lopus et al., 2019). Kolb's experiential learning theory, in which theory and application of techniques converge in intensive, 'hands-on' teamwork experience, results in a highly effective learning process involving soft skills as well (Gadola & Chindamo, 2019). The project deals with Ecuador's isolated Kichwa community and involves developing alternative science education materials for the capacity of science teachers in the department. Evaluation of how FDD is conducted in accordance with the principles of Service-Learning (SL) can help in acquiring "soft skills" and how this can be focused on promoting knowledge and achieving sustainable development goals (SDGs) (Hernández-Barco et al., 2020). Students need to participate in project activities, which are used to assess student learning outcomes with a focus on soft skills and project management skills (Khandakar et al., 2020).

Generic competence and "soft skills" are also important, given their significant contribution to students' academic, personal, social, and professional development (Santos Rego et al., 2021). Professional status of university graduates, accredited status and professional education programs, as well as subjective characteristics that are to be realized in the competence of professional graduates who have hard skills and soft skills (A. G. et al., 2019). Improving college graduates' employability degrees requires educators to develop not only students' academic knowledge or "hard skills", but also transversal or "soft" skills in order for them to be worthy of the demands of modern work. In turn, it is necessary to revise the curriculum and syllabus at the College (Qizi, 2020). The high need for manpower is not only to acquire hard skills, namely theoretical knowledge and practical skills related to one's expertise, but also to have soft skills which include effective communication, critical and creative thinking, analytical and managerial skills, and interpersonal skills (Medvedeva & Rubtsova, 2021). Higher education includes teaching, research, application of knowledge, and social service activities. In the field of teaching, it covers both undergraduate and postgraduate levels.

The main goal of higher education is to produce graduates who are professionals in becoming leaders, recognized members of their communities, and responsible citizens (Vilma & Marius, 2020). Other skill enhancements can use the application of Project-Based Learning to develop leadership and managerial skills (Wahid et al., 2020). There are still teachers who are reluctant to use information technology as a medium in learning. Devices that have computing power as well as the presence or absence of a network (Sohal et al., 2018). The purpose of learning and education is to adopt a lot of digital devices. This can be observed in the years around 1997-2006 when computers were used intensively for collaborative learning so that online digital learning was widespread (Radianti et al., 2020). Next, we explore conceptual and methodological issues in the current literature and provide recommendations for using digital platforms (de Reuver et al., 2018). Investments in information and communication technology (ICT) that drive productivity growth (Niebel, 2018). The conclusion is that modern technological learning is related to information communication technology that approaches aspects of human thinking processes (Dziuban et al., 2018). From a social perspective, job loss and risks associated with organizational transformation as a result of technological advances are some of the aspects considered. In addition, risks can be security with information technology (IT) such as data, and legal and political risks, such as unresolved laws regarding data ownership (Birkel et al., 2019). In the current era, there are still few international studies on self-efficacy that analyze students' confidence in using Information and Communication Technology (ICT) in finding their digital literacy (Hatlevik et al., 2018). Until now, there is not much to learn about junior high school students' self-perceptions of Information and Communication Technology skills compared to real skills (Hatlevik et al., 2018). Big data, Internet of Things, and smart factories are components of industry 4.0 encouraging the implementation of information technology (IT) in a positive way in terms of sustainable business (Haseeb et al., 2019).

Soft skills education has not been effective in improving problem-solving skills. The criterion that characterizes the effectiveness of the higher education system is the quality and service of education provided by higher education institutions (A. G. et al., 2019). Various fields that can support individual soft-skills. Entrepreneurial skills and sustainable personal career management. All of these are critical to the success of the project, designating Generation Z as a promissory asset in the field of project management. In addition, some soft skills do not stand on personality profiles, namely self-emotional control and emotional maturity (Magano et al., 2020). Teach design thinking to students as a skills-based tool to prepare students for problem-solving in complex environments (McLaughlin et al., 2019). One of the most important focuses in education is developing the power of thinking to solve problems because problem solving is a fundamental thought process for humans which has been identified as a natural intelligence that functions for the basis of life (Buckley et al., 2019).

There are many challenges in the adolescent maturation process in terms of physical, psychological, and social maturation. Adolescence is a critical period in terms of the physical and psychological well-being of young people. In general, teenagers try psychoactive substances such as alcohol, tobacco, and marijuana at this age (Moore et al., 2018). This is very worrying for parents. As teens begin to strive for more autonomy, parents need to adapt their behavior and expectations to more egalitarian relationships with their children (Mastrotheodoros et al., 2019). At the same time, it became clear that the individual benefits of group collaboration improved interpersonal skills. In addition, one of the most consistently linked to progress is discussing through dialogue groups of different opinions about the issue at hand (Howe & Zachariou, 2019). Adolescent development includes physiological and psychological development that occurs during the second decade of life. Adolescence is associated with an increase in behaviors such as peer-directed interpersonal relationships, novelty seeking, and risk taking (Amodeo et al., 2018). Critical development of mental health and its symptoms occurs in adolescence (Kwong et al., 2019), and therefore, it is very important to screen early on risks that could increase vulnerability (Negriff, 2020). Given the growing recognition that adolescence serves as the basis for a lifelong health trajectory (Moreau et al., 2019). The developmental trajectory of social status and social behavior in early childhood and adolescence predicts the involvement of the role of bullies in adolescence (Pouwels et al., 2018). Emotions can be regulated in many ways, from thinking about one's own problems to solving problems with friends or distracting yourself from emotions altogether (Lennarz et al., 2019) (Lennarz et al., 2019)..

## **V. CONCLUSION**

Teenagers should have problem-solving skills. Problem-solving skills contribute to adolescents achieving their goals. Soft skills education is based on information technology as a means of practicing problem-solving skills. Soft skills education based on information technology is a place to sharpen adolescent knowledge about strategies to solve problems. Soft skills education based on information technology can improve adolescent

problem-solving skills. This research has implications for the formal development of soft-skill services at the university through the provision of a Technical Guidance and Counseling Service Unit to ensure the spiritual well-being of students. Thanks are conveyed to the Head of Slamet Riyadi University who has allowed conducting research. Lp2M leadership has facilitated conducting research.

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