The 21st century skills of prospective teacher students in the industrial revolution 4.0 era (the adaptation and problem-solving skill)

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Abstract. The research aims to describe the achievement of 21st century skills such as adaptation and problem solving as part of 21st century competency in Surakarta Muhammadiyah University students to prepare of the industrial revolution 4.0. The study involved 191 prospective teacher students in Universitas Muhammadiyah Surakarta. This study is a mixed method with exploratory sequential design. The study finds that teacher students’ adaptation capability is need much improvement. The majority of students say that they prefer to wait for someone else to start the conversations. Furthermore, they are worried to enter in the new society. In the problem-solving skills, most students focus on the solution when facing a problem. This is reasonably good, but some literature posits the finding a factor of the problem is the best way to solve a problem. Besides, there are still students who sceptic and tend to escape from the problem without any solution. This study suggests that it is prominent to include adaptation and problem-solving analysis for prospective teacher-student candidate before accepted in the university.

1. Introduction
Education is vital for the personal, social, and economic development of the nation. As a human, training helps people to live in happiness and prosperity with not only knowledge that they get but also soft skills which are prominent in people life. In the social context, education encourages people to understand how to live together in the community and have an impact on improving peripheral society. Furthermore, national economic development is very relied on how the government arrange the education system.

The way of running the education system is the critical role in preparing the young ready for the dynamic world such as the industrial 4.0 in the 21st century. In this era, the education needs to optimize many opportunities and resources available in the rapid changes in the globalized world and massive borderless connection among nations in the many sectors, including education[1]. Many opportunities emerge in the opened world such as there will be a gigantic opportunities job in foreign countries that can be applied, the broader economic expansion, the simplicity in investment, and more connected people that can encourage people can learn from many sources. However, the 21st-century era with rapid technology growth, the challenges emerge. A nation that has low skilled labor and lack of innovation can be slump by the more civilized country. Furthermore, the fourth industrial revolution takes the automation of manufacturing processes to a new level by introducing customized and flexible mass production technologies.

The needs of human capital upskilling in the 21st century and the massive technology development are very challenging, especially in developing countries. One of the most critical is recruiting and developing new talent to run the new business model. This issue makes the education reformation is
essential to prepare the students can meet the current and future required skills. In this case, the teacher has the most significant role in the education process so that the students can have the twenty-first-century skills and being the long life learner [2] and in the 21st century the classroom management is very depending on the teacher professionalism [3].

To improve teacher professionalism, it is prominent to educate the prospective teachers to support them fulfill the complex task in twenty-first-century learning [4]. As educators, they need to master all the skills that will be transferred to their students. There are several skills of the twenty-first century namely 1) communication and collaboration, 2) communicate clearly, 3) collaborative with others, 4) Critical thinking and problem solving, 5) creativity and innovation, 6) leadership and responsibility, 7) productivity and accountability, 8) social and cross-cultural skills, 9) learning environment adaptation skill [5]–[7]. The prospective teachers require to master those skills as the 21st-century skills before they teach the pupils to ready in the industry 4.0 era.

The 21st skills learning is critical to be implemented in the prospective learning process in the college. However, the current system indicates that there are sixteen weaknesses in the educational system to facing twenty-first-century skills challenge[8] even though there is some ICT integration in the learning process [9]. This study reveals that the current educational system for the prospective teacher does not accommodate most of the future skills, and there is a role of a learning environment that should be enhanced [5].

Some studies reveal the achievement of 21st-century skills among students. The high socioeconomic students in Malaysia are better than lower socioeconomics students which are consist of five domains namely Digital Age Literacy, Inventive Thinking, Effective Communication, High Productivity, and Religion, Health and Civic [10]. In Singapore, the six dimensions of twenty-first-century skills are achieved by implementing 21LCD (21st learning competency design) [11].

However, despite the fact that the students' competency in ICT is relatively good, there is no positive correlation toward the students' mastery in 21st-century competencies[12]. This condition can be fathomed that the usage of ICT in the current young generation is dominated by using social media. They tend to waste their time by browsing on YouTube, Facebook, Twitter and many other platforms which are less productive. In addition, in this condition, the long-life learning concept is prominent for everyone in this century because there are many changes in a very short period of time[2].

To develop the future generation with high skilled based on the 21st-century competencies, the education for educators is critical to internalized the value of 21st-century competencies into prospective teacher students. One of the many solutions is the implementation of Internet-based education. A study reveals that the internet-assisted learning among prospective chemistry teacher escalate their mastery in the content of the material[13] and it is indispensable[14], in addition, to enforce potential teachers skills in present are critical thinking and cooperating with colleagues [15], [16]. However, dealing with a new situation for prospective teachers is not easy. The intercultural condition force the students to adapt in the new environment in both social and physical context[17] and also on the broader scope it occurs as a cultural shock[18] and therefore all prospective teachers should adopt in the social context in the educational process [19].

The past studies indicate that there is a need to enhance the new concept of education to accommodate the current development in industry 4.0 era and the 21st century needed skills. To develop a learning model in this era, it is prominent to comprehend the current situation of the 21st-century skills among prospective teacher students. This study aims to describe the competency of Adaptation and Problem solving as part of 21st-century skills among Universitas Muhammadiyah Surakarta prospective teacher students and to develop a model for recruiting new talent for teacher candidate.

2. Methodology
This study is a mixed method research by using exploratory convergent design. A mixed method is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative methods in a single study or a series of studies to understand a research problem[20]. There are several designs in mixed method procedure. The exploratory convergent design which is used in this study consist of collecting
and analyzing qualitative data builds to quantitative data collection and analysis, in turn, data interpretation of both data. The study acquires qualitative data by conducting interviews in 15 students followed up with deploying questionnaire in 191 respondents. The research design is described as follows:

Figure 1. The Methodology

3. Results and Discussion

3.1. The adaptation skill
In Universitas Muhammadiyah Surakarta (UMS), students’ come from the entire province in Indonesia so that there is a diversity in the ethnic and cultural context. This condition makes students from various backgrounds can communicate with each other on campus daily interaction. However, dealing with this condition is challenging. Learning in different setting takes time and requires commitment, emphasising the need for careful consideration of facilitation techniques, preparation, support and planning pedagogies that encourage active intercultural learning[17]. The term different setting learning in this context is not only about learning in distance area but also learning activities in a different place for a short time, such as students’ internship.

The interviews on prospective teacher students in UMS reveal that some of them state that they need time to adapt to the new social environment. They said “I speak as needed” and “I wait for somebody else to talk first”. These students tend to wait and look challenging to deal with a new situation. Another student said that it only needs two days to fit in the group, “maybe only 1-2 days to join in the new group and we have talk each other as we have known each other for a long time”.

In the preliminary study, it can be inferred that some of the prospective students have difficulty when facing new condition. However, this is not a clear indication to draw the adaptation skills among them so that the study deploys a questionnaire to catch the general description of the adaptation skill. The results as follows:
Table 1. The willingness to start talking in new group

| No | The Attitude                | Frequency | Percent  |
|----|-----------------------------|-----------|----------|
| 1  | Always start a conversation | 70        | 36.65%   |
| 2  | Sometimes start a conversation | 118      | 61.78%   |
| 3  | Never start a conversation  | 3         | 1.57%    |
|    | **Total**                   | **191**   | **100%** |

The table shows 36.65% participants in this study state that they do not hesitate to start a conversation when joining in the new community, while mostly the students (61.78%) prefer to start talking with the new friends occasionally. Interestingly, there are still 1.57% of students who are reluctant in starting a conversation when joining a new group.

There are several reasons for the choice of student attitudes; these are the summary of their ideas:

Table 2. The Reasons of Students’ Attitude When Facing New Community

| No | Willing to start new conversations | Reasons                                      |
|----|-----------------------------------|----------------------------------------------|
| 1  | Always                            | Expecting to have best friends              |
|    |                                   | Understanding the new environment           |
|    |                                   | Knowing each other                          |
|    |                                   | Being an active person                      |
| 2  | Sometimes                         | Lack of confidence                          |
|    |                                   | It depends on the situation and condition   |
|    |                                   | Worrying to offend other people             |
|    |                                   | Having difficulties in starting a new talk   |
|    |                                   | Shy                                           |
| 3  | Never                             | I cannot adapt easily in any situation      |
|    |                                   | I have difficulties in fitting in group     |
|    |                                   | I don’t like to start new talk              |

The table above shows the rationale of the students’ in joining the new group attitude. The students who always want to start to talk in the new community explain that being active in a new community is essential. Having a new best friend and understanding the peripheral situation is critical for newcomers. They need to be open-minded while attempting to know each other. These kinds of manners exist in active and enthusiastic prospective teacher students.

On the other side, many teacher candidates prefer to expect other people to start a new conversation. These students mostly lack confidence, worrying about offending other people and feeling shy when joining a new group. These feeling force them in the situation that fitting in a new group is very depending on the location and condition after ensuring that they will be accepted in the group. Furthermore, there are some teacher’s candidate who never try to start a new conversation in the new community. Based on the reasons that they express, it is caused by the internal situation in their mind such as the feeling that they are quiet people, having difficulty to deal with a different location, and they do not like to talk with new people.

The analysis is widened to explore whether the prospective students worry when joining in a new situation such as teaching practice in school.
Table 3. Concerning in teaching practice situation and new community

| No | Behavior       | Frequency | Percent  |
|----|----------------|-----------|----------|
| 1  | Worried        | 33        | 17.27%   |
| 2  | Sometimes Worried | 119   | 62.3%    |
| 3  | Confident      | 39        | 20.41%   |
| Total |               | 191       | 100%     |

The table describes the first feeling when the prospective students face the teaching practice in school or joining a new community. Interestingly, mostly, they feel awkward in that condition. Seventy percent of them says that they always worry about dealing with teaching practice, joining with a new friend in practice, and eventually have less confidence. Furthermore, 62.3% of prospective students frequently cannot deal with the situation. Conversely, few teacher candidates always feel confident in all condition, including when conducting teaching practice.

There are some consistencies from the prospective teacher who never try to start a new conversation. Further analysis reveals that all of them have internal difficulties when facing a new challenge. These some of their answers when asked about that issue:

Table 4. Internal difficulties of prospective students in dealing with new community

| No | Students’ Type         | Analysis                                                                 |
|----|------------------------|--------------------------------------------------------------------------|
| 1  | Worried                | He / She does not like to start a new talk with every person. They tend  |
|    |                        | to be passive in every condition. They said that they prefer to use their |
|    |                        | gadget.                                                                  |
| 2  | Sometimes Worried      | He / She said that He / She is a kind of person that have difficulties   |
|    |                        | in associating with their peers, in turn they always feel awkward in     |
|    |                        | every condition that need coordinating with new people. Unfortunately,    |
|    |                        | they do not try to face this condition, they prefer to stay away from the |
|    |                        | group and eventually they do not have any friend.                        |
| 3  | Confident              | He / She always waits other people to ask for a talk.                    |

3.2. Problem identifying and Problem Solving Skills

Problem-solving skill is prominent to prospective teachers because they will face many problems while teaching and corresponding with their colleagues in their daily work activities. This study explores problem solving when the prospective teachers do their practice in school in term of teaching practice, relationship with peers, and their communication with teachers.

A respondent is asked about a problem in the teaching practice process, he / she said “sometimes, there are students that hyperactive, sleeping in classroom, talking with their friends” and also “there are many groups in the class, there is a student that get bullying from their friends because he/she ever steal money. Beside it, there is a student that always shy in class and never communicate with friends so that he/she almost always miss the homework”. The challenge occurs when making groups for discussion; the students tend to choose friends that they are intimate. They said, “the active students are not disposed to be a group with students that they think as inactive students”.

Based on the challenges faced by teacher trainees, the study continues to investigate how they solve those problems. A source person said that “when there is a dispute between two groups of students, I try to talk to both, I think it works”. Besides it, a student is playing his / her smartphone in the lesson process; a prospective student prefers not to confiscate it, she tries to attract students to focus on the
lesson. She thinks the students must have been bored when she is explaining the material. Based on the teacher trainee responses, it seems that the prospective teachers have tried to solve the problems with avoiding conflict. They try to solve problems based on their experiences.

Twenty-first-century learning necessitates teachers to overcome the obstacle in an understanding of students. There four steps in problem-solving such as defining the problems, thinking the alternative solutions, evaluating and selecting the appropriate solutions, and also implementing the solution chosen to solve the problem (https://www.mindtools.com/pages/article/newTMC_00.htm accessed at 6 Mei 2019). Based on this terminology, the study continues to explore how the prospective teacher students think when they were facing a problem while they do practice in school both as a teacher and as a teacher’s colleague. These are below the teacher trainees focus when trying to solve problems:

Table 5. The prospective teachers focus when facing problems

| Main Focus                        | Frequency | Percent |
|-----------------------------------|-----------|---------|
| Thinking Solution                 | 81        | 42%     |
| Defining Problems                 | 107       | 56%     |
| Look for who is the guilty person | 3         | 2%      |
| **Total**                         | **191**   | **100%**|

The table above shows the students’ stressing when facing a problem. The data depicts that most of them focus on the defining difficulties, while 42% of students focus on thinking the solution. Unfortunately, there are still 2% blaming other people in a different situation. These data, in turn, be confirmed by conducting the opened questions about how the students act when facing a dispute in class or with their colleagues. These are the brief answers:

Table 6. The teacher students’ strategies on solving problems

| No | Student Type | Perception on Problem | The main focus when facing problems | The way on solving problems |
|----|--------------|-----------------------|------------------------------------|-----------------------------|
| 1  | A            | A challenging thing and must be faced | Solution                           | I think, problem encourages us to be more mature in any situation therefore, I should make a best solution on that. I try to look at other people perspective on that issue and then looking for the best solution without any conflict I think what solution is needed, whether this solution is an expected solution or it will make the problems getting worse? I try to make a best solution, however, there are many problems that I keep it in mind without any solution. Sometimes, I ask someone else to help me. |
| 2  | B            | A challenging thing and must be faced | The background of problems          | I try to identify the causes, then I solve the problems and avoiding the further conflicts. I try to identify the factors, then I think deeply alone and make a solution Usually, I investigate the problems causes and then make a solution |
| 3  | C            | A burden               | Blaming others                      | Don’t be stubborn I think, I should avoid any problems |
3.3. The critical need of adaptation skill assessment for teacher candidate students

Despite the adaptation process is always challenging and need several steps while joining in a group. [21], this study indicates that some prospective teachers are having difficulties in the adaptation. At least there are 1.57% of students never start a new conversation, and most of them are occasionally try to fit in the group. Furthermore, most of them are not fully confident when facing practice as a teacher, even if they are education faculty students. This is undoubtedly quite worrying considering that adaptive capacity is greatly influenced by self-ability [22].

These facts reveal that the students are not ready or not having part of twenty-century skills as an educator. The interview depicts that most education faculty students are a quiet person, shy, and almost always worry about starting a new conversation. This fact shows that most prospective teachers have various obstacles to adaptation when encountering multiple problems in the social and professional context in the classroom.

These results certainly have a severe impact on the development of Education in the 21st century because teachers must be able to develop student skills to be able to compete in the future era. The inability of teachers to adapt to various aspects of problems that occur in schools can lead to low-quality teachers. A study states that teachers' mental representations of their dyadic relationships with students had a significant role in mediating teachers' negative affective responses to perceived student problematic behavior [23].

In accordance with the competencies required in the Education law in Indonesia, the teacher not only must have professional skills (mastering the material taught) but also must have social skills (relationships with coworkers, students, and society), personality (able to learn themselves and bring yourself as a teacher), and pedagogic (the ability to manage classes and learning). In addition, the strength of adaptation in classroom management and the relationship between students and teachers can bring up the professional identity of the teacher and have an essential role in the quality of learning [24], [25].

In the context of mastering adaptation skills for teachers, of course, this is closely related to social competence and personality competencies and professionalism of a teacher. [25]. The teacher must have good social adaptability in the work environment with fellow teachers or with students, even with the surrounding community. This ability will not only have a social impact but can have an effect on the teacher's professional skills where with the ability to adapt, teachers can learn from each other with colleagues or even with students. The development of teacher professionalism is closely related to a good relationship between a teacher and colleagues, students and the community.

Based on the results of this study, it is felt vital for the process of admitting new students to prospective teachers to consider aspects of adaptability. Prospective teachers must have a strong foundation for adaptive capacity, given the conditions that will be faced will continue to change both in the context of social, scientific, and even developing the technology. This adaptation capability is the initial capital for prospective teachers to be able to establish themselves in the 21st century and be able to adapt to the global environment.

3.4. The need of problem-solving skill analysis for teacher student’s candidate

The teacher is expected to be a person who are creative, problem solver, and innovative. As an educator, the teacher will face many challenging situations that need creativity, endurance, and patience. The problems emerge from several aspects such as social context with the colleagues, students’ academic problem and attitude, even the teacher’s personal issues. These conditions including emotional intelligence make the teacher more innovative and improve the career [26].

The findings of this study reveal that some of the students are trying to solve problems by using the personal approach. For example, when two students are a quarrel, the teacher candidate tries to talk to both and expecting to understand the issue and then mediate both of them. Furthermore, they use a focus group discussion technique to understand the students’ problem.

The further finding depicts that most students have tried to solve problems by conducting several approaches. Most students have the view that the problem is something that must be faced, and they
have been attempting to solve the problem by focusing on the solutions offered, and the cause of the problem occurred. Even so, there are still a small number of prospective teacher students who tend to blame others rather than focus on solving problems. This student group tends to avoid problems by blaming others. This fact is undoubtedly quite worrying for a prospective teacher who will always face different issues. These results are in accordance with the results of previous studies where teachers have a low perception of their problem-solving abilities [27].

The ability to manage conflict by utilizing feedback from coworkers is one of the most important things where feedback has a positive impact on the problem-solving skills of prospective teachers. [28]. In addition, the more a prospective teacher faces a problem the better the problem-solving ability [29]. The results of this study indicate that there are still prospective teachers who do not show that they have excellent problem-solving skills; therefore, it would be better to recruit prospective student teachers to consider the skills in 21st-century competence, one of which is problem-solving.

4. Conclusion
The study reveals that the adaptation skill among the prospective teacher students need to be enhanced, while the problem-solving ability is relatively reasonable but still need more enforcement. These facts are critical for future human development; therefore, the teacher recruitment paradigm must be changed. The education universities (faculty) have to reform the minimum requirement not only consider the academic aspects but also, they need to assess the 21st century skill of the students (including adaptation and problem-solving ability).

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