

Factors Affecting Indonesian Higher Education Institution Students' Academic Achievement in the Industry 4.0 Era

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ABSTRACT

Industry 4.0 presents new challenges for Higher Education Institutions in Indonesia. Jobs in this era requires intellectual capabilities at a higher level. One of the ways to measure intellectual capabilities is through Academic Achievement in the form of Grade Point Average (GPA). Organizations around the world, including in Indonesia, want employees with high GPA. Therefore, it is imperative for Higher Education Institutions in Indonesia to understand the factors affecting Students' Academic Achievement. This study conducts literature reviews to find and analyse factors affecting Indonesian Students' Academic Achievement in Industry 4.0 era. This study finds 28 factors. Based on these factors, this study develops development initiatives that Indonesian Higher Education Institutions in Indonesia can do in order to improve Indonesian students' academic achievement.

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1. Introduction

Industry 4.0 presents opportunities and new jobs creations but it also presents new challenges. The new jobs created requires intellectual capabilities at a higher level. One of the most common way to measure intellectual capabilities is through Academic Achievement. Academic Achievement is one of the most important subject within the field of education. The American Psychological Association defines Academic Achievement as “any identifiable success in the areas of scholarship or disciplined study.” (American Psychological Association, n.d.). The most common indicator of Academic Achievement is the Grade Point Average (GPA).

All around the world, Academic Achievement in the form of GPA plays a very important role in shaping the future and career trajectory of college students and graduates. GPA is used by employers to shortlist good candidates for both internship and full-time vacancy (Tai, 2020). GPA is also an important factor in getting admitted to a master degree program (Dunlap et al., 1998). GPA is also very important for Indonesian Higher Education students and graduates. A research on the relationship between GPA and success in finding a job conducted by Sulastri et al. (2015) in Indonesia found that GPA is a significant factor in getting a job. Multinational companies operating in Indonesia and large national companies usually want fresh graduates with a minimum GPA of 2.75 or 3.00 (Idris, 2020) but many requires a minimum GPA of 3.25 (Susanto, 2015).

As the world gets more intense in implementing Industry 4.0, organizations in Indonesia will create higher standards for their vacancies, including higher GPAs. This is why it is important to understand the factors affecting academic achievement. Every higher education stakeholder in Indonesia, starting from policy makers, higher education institutions, parents, to higher education students themselves, need to understand these factors. Only then, the stakeholders, depending on where they are in the higher education ecosystem, can develop and implement the necessary policies, strategies, and action plans to increase students' academic achievement nationally.

This main purpose of this study is to list and analyze the factors affecting academic achievement of Indonesian Higher Education Students in the era of Industry 4.0. A plethora of research articles in this matter has been published in

various journals. "Industry 4.0" was first publicly introduced to the world by the German Federal Government in 2011 (Luenendonk, 2019). Since this study focuses on Industry 4.0 era, this study will conduct literature review only on research articles published after 2011. This study used 2013 as the starting point for the literature review. This study will also discuss what higher education institutions can do regarding the factors.

2. Method

This study used literature review method. Google Scholar was used as database for finding relevant journal articles. The search was conducted on June 2021. The keywords used were: "Academic Achievement", "Pencapaian Akademik", "Academic Performance", "Prestasi Akademik", "Grade Point Average", "Indeks Prestasi Kumulatif", "GPA", and "IPK".

Inclusion and Exclusion Criteria is used in the literature review. Usage of inclusion and exclusion criteria is common in various journal articles that used literature review method, such as (Kusumastuti, 2020). The inclusion and exclusion criteria for this study can be seen in Table 1.

Tabel 1. Inclusion and Exclusion Criteria for Literature Review

Inclusion	Exclusion
Journal Articles	Conference Proceedings, Thesis, Dissertation
Quantitative Research Design	Qualitative Research Design
Research papers that used GPA as the measurement of Academic Achievement	Research papers that used non-GPA measures as the measurement of Academic Achievement
Research papers that used Diploma and Bachelor degree students as the sample	Research papers that used non-Diploma/Bachelor degree students as the sample
Research papers that conducted research on Indonesian Higher Education Institutions	Research papers that conducted research on overseas Higher Education Institutions
Research papers that focused on the factors that influence Academic Achievement	Research papers that focused on other issues regarding Academic Achievement
Publication Year: 2013 - 2021	Publication Year: other than 2013 - 2021

3. Findings

Based on the literature review, there were a total of 28 factors influencing academic achievement found. These factors were then categorized based on Demographic-related factors, Individual-related factors, Environment-related factors, Lecturer-related factors, as can be seen in Table 2.

Tabel 2. Factors Influencing Academic Achievement in Indonesia

Code	Factor	Source
A. DEMOGRAPHIC-RELATED FACTORS		
A-1	Parent Level of Education	Marceylla & Subroto (2021)
A-2	Socioeconomic Status	Oktavianingtyas (2013) Agustine et al. (2014) Marceylla & Subroto (2021)
A-3	Working while Attending College	Magdalena & Muhson (2017)
A-4	Gender	Munisah & Khusaini (2017)
B. INDIVIDUAL-RELATED FACTORS		
B-1. Individual-Related Factors: Learning		

B-1-1	Self-Efficacy	Chairiyati (2013) Rahmi et al. (2017) Anshori et al. (2019)
B-1-2	Learning Interest	Agustine et al. (2014) (Then, 2019)
B-1-3	Learning Motivation	Yusuf (2013) Oktavianingtyas (2013) Yuliyanti (2015) Zurimi & Dahlan (2016) Silfiyani & Hariyati (2018) Amir (2019) Then (2019) Welong et al. (2020)
B-1-4	Learning Attitude	Agustine et al. (2014)
B-1-5	Self-regulated Learning	Sudirman (2015)
B-1-6	Metacognitive Competence	Yuliyanti (2015) Zurimi & Dahlan (2016)
B-1-7	Autonomous Learning	Rahmi et al., (2017)
B-1-8	Learning Behavior	Madhuri (2017)
B-1-9	Learning Anxiety	Zurimi & Dahlan (2016) Hasibuan & Riyandi (2019)
B-1-10	Self-concept	Zurimi & Dahlan (2016)
B-2. Individual-Related Factors: Intelligence		
B-2-1	Intellectual Intelligence	Silen (2014) Rosita et al. (2015)
B-2-2	Emotional Intelligence	Silen (2014) Zurimi & Dahlan (2016) Madhuri (2017)
B-2-3	Spiritual Intelligence	Silen (2014) Madhuri (2017)
B-3. Individual-Related Factors: Communication & Digital Activity		
B-3-1	Interpersonal Communication Skills	Ariyani & Hadiani (2020)
B-3-2	Communication Anxiety	Sofyan et al. (2015)
B-3-3	Social Media Addiction	Anshori et al. (2019)
B-4. Individual-Related Factors: Health		
B-4-1	Physical Condition	Oktavianingtyas (2013) Welong et al. (2020)
B-5. Individual-Related Factors: Social Activity		
B-5-1	Active Participation in Student Organizations	Efendi et al. (2020)

B-5-2	Active Participation in Society	Agustine et al. (2014)
B-5-3	Circle of Friends	Agustine et al. (2014)
C. LECTURER AND LEARNING ENVIRONMENT -RELATED FACTORS		
C-1	Lecturer Competency	Suarjana & Yintayani (2017) Jani (2020)
C-2	Lecturer Teaching Style	Silfiyani & Hariyati (2018)
C-3	Variation in Lecturing Methods	Jani (2020)
C-4	Learning Environment (Physical & Social)	Oktavianingtyas (2013) Sudirman (2015) Yuliyanti (2015)

4. Discussion

4.1 Demographic-related Factors

Parent level of education (A-1) has an influence on Academic Achievement. Marceylla & Subroto (2021) found that parent level of education has an effect on GPA. Marceylla & Subroto (2021) conducted research on 83 Economics Education major students from State University of Surabaya (UNESA) and found that students who had highly educated parents achieved higher GPAs than those who did not. Several researchers, such as Kim et al. (2020) and Eveland (2020), have conducted research on first generation college students and continuing generation college students. The term "first generation college students" means college students who did not have at least one parent who went to college. Students whose parents did not go to college and have siblings who went to college are still considered as first generation college student because the term focuses on "first generation", not "first in family". The term "continuing generation college students" means college students who have at least one parent who went to college. Kim et al. (2020) found that first generation college students in had lower academic achievement than continuing generation college students. Eveland (2020) also found that first-generation students had lower GPAs than continuing generation college students.

The reason behind this factor's influence on students' academic achievement is most likely related to the parents' capabilities. Parents who went to college have better capabilities in guiding their children and they have higher expectations regarding the education of their children. Toutkoushian et al. (2021) found that the parental education level affect college completion. This is because parents with college degree can guide their children in completing their study at a higher education institution. Sommerfeld (2016) found that parent education expectations affect education outcomes of their children. Even before attending college, children who has at least one parent who attended college are given more encouragement and frequent communication about higher education. Carpenter & Fleishman (1987) found that perceived parental encouragement would influence their children's decision regarding college attendance. Widiarto et al. (2018) found that parental communication has an effect on students' decision in choosing major in college. Their children were more knowledgeable regarding college level education and ultimately contributed to their academic achievement.

What first generation college students do not have regarding this matter is encouragement, guidance, and information regarding higher education from their parents. Universities can give special counselling sessions for first generation college students that consist of encouragement, guidance, and information that other students normally received from their parents.

Socioeconomic status (A-2) has an effect on Academic Achievement. Oktavianingtyas (2013), Agustine et al. (2014), Marceylla & Subroto (2021) found that Socioeconomic status was significantly correlated with GPA. Students from low-income families normally has lower GPAs than other students. (Oktavianingtyas, 2013) conducted research on 178 Mathematics Education major students from University of Jember (UNEJ), Jember. (Agustine et al., 2014) conducted research on 188 Nursing major students from Kupang Health Polytechnic, Waingapu Campus. (Marceylla & Subroto, 2021) conducted research on 83 Economics Education major students from State University of Surabaya (UNESA)

Students from low-income families obviously has disadvantages than other students. First, they have less access to the knowledge that their more affluent peer normally has. Parents of low-income families usually do not have college

degrees. Normally, they do not have the capacity and knowledge in guiding their children regarding studies in higher education level. Universities can give special counselling sessions for students from low income families. Second, facilities that they have are usually insufficient. For example, students from low-income families could not afford laptops and broadband internet access. They often rely on campus facilities.

It is important for higher education institutions to conduct special development initiatives that are specifically targeted at first generation college students and students from low income families. For students who were born into low-income families, getting a degree means having a chance for upward social mobility and also the chance to pass on their educational advantage to their children when they become parents themselves (Venator & Reeves, 2015).

Working while attending college (A-3) has an impact on Academic Achievement. Magdalena & Muhson (2017) found that students who had a part-time job during college has lower GPA than those who did not have a part-time job. Magdalena & Muhson (2017) conducted research on 205 students from the Faculty of Economics of State University of Yogyakarta (UNY).

The reason behind this is most likely because students who worked during their study has less time to learn. The reason why student work during their study usually because of lack of money and desire to acquire job experience. There is no solution to those who work to find money but to those who work because they want job experience, it is better that they are informed that GPA matters in getting a full-time job in the era of Industry 4.0.

Gender (A-4) has an effect on Academic Achievement. Munisah & Khusaini (2017) conducted research on 168 Economics Education major students from Syekh-Yusuf Islamic University (UNIS), Tangerang and found that female students has better GPA than male students. It is most likely because female students, in general, are more diligent and more focused on their studies than their male counterparts. Female students have better planning and they set academic goals and strive to achieve their goals (Gnaulati, 2014).

4.2. Individual-related Factors

Self-efficacy (B-1-1) has a positive effect on Academic Achievement. Chairiyati (2013), Rahmi et al., (2017), (Anshori et al., 2019) found that self-efficacy has a significant correlation with GPA. Chairiyati (2013) conducted research on 192 psychology major students from a private university in Jakarta. (Rahmi et al., 2017) conducted research on 67 Chemistry Education major students from Syiah Kuala University (UNSYIAH), Banda Aceh. Anshori et al. (2019) conducted research on 90 Islamic Education major students from Islamic University of Malang (UNISMA). Solberg et al. (1993) stated that Self-Efficacy in higher education learning context is students' level of confidence in completing higher education activities and assignments. Universities can conduct trainings to instil confidence in students.

Learning interest (B-1-2) has significantly influenced Academic Achievement. Agustine et al. (2014), Then, (2019) found that learning interest has a significant correlation with GPA. Agustine et al. (2014) conducted research on 188 Nursing major students from Kupang Health Polytechnic, Waingapu Campus. Then, (2019) conducted research on 100 Chinese Language major students from Sekolah Tinggi Bahasa Harapan Bersama, Kalimantan Barat. Schiefele (1991) defined interest as motivational characteristics that are composed of intrinsic feeling-related and value-related valences. Since it is intrinsic feeling-related, perhaps universities should conduct Interest and Aptitude test in order to make sure that students are interested to study in the major that the students choose.

Learning motivation (B-1-3) is affecting Academic Achievement. Most research shows that Intrinsic Learning Motivation is positively correlated with GPA while Extrinsic Learning Motivation is negatively correlated with GPA. Yusuf (2013), Yuliyanti (2015), Zurimi & Dahlan (2016), Silfiyani & Hariyati (2018), Amir (2019), Then (2019), Welong et al. (2020) found that Intrinsic Learning Motivation has a positive significant correlation with GPA. Oktavianingtyas (2013) found that Extrinsic Learning Motivation has a negative significant correlation with GPA. Yuliyanti (2015) conducted research on 60 Nursing major students from Bhakti Mulia Health Polytechnic, Sukoharjo. Zurimi & Dahlan (2016) conducted research on 214 students from the Faculty of Education of Darussalam Ambon University (UNIDAR), Ambon. Silfiyani & Hariyati (2018) conducted research on 185 Education Management major students from State University of Surabaya (UNESA), Surabaya. Amir (2019) conducted research on 50 Nursing major students from Kaltara Nursery Academy, Tarakan. Then (2019) conducted research on 100 Chinese Language major students from Sekolah Tinggi Bahasa Harapan Bersama, Kalimantan Barat. Welong et al. (2020) conducted research on 60 Health and Safety major students from Sam Ratulangi University (UNSRAT), Manado. (Oktavianingtyas, 2013) conducted research on 178 Mathematics Education major students from University of Jember (UNEJ), Jember. I.-Y. Chang & Chang, (2012) defined Learning Motivation as the force that drives active and strong learning motivations which ultimately leads to better results in learning. Universities can

deliver seminars on motivation building for first-year students in order to make sure that students have high learning motivation from the beginning of their study.

Learning Attitude (B-1-4) has an effect on Academic Achievement. (Agustine et al., 2014) found that learning attitude has a significant correlation with GPA. Agustine et al. (2014) conducted research on 188 Nursing major students from Kupang Health Polytechnic, Waingapu Campus. C.-P. Chang & Teng (2009) stated that learning attitudes is a passion for learning. Higher Education Institutions can deliver special introductory sessions for first year students in the first months of their study that are consisted of career outcomes explanations, industry visits, and inspiring stories on how certain methods were actually implemented in industries. Understanding the benefits of studying in their respective majors from the beginning will help students develop a good learning attitude.

Self-regulated learning (B-1-5) has an effect on Academic Achievement. Sudirman (2015) found that self-regulated learning has a positive significant correlation with GPA. Sudirman (2015) conducted research on 150 Islamic Studies major students from Imam Bonjol Padang State Institute for Islamic Studies (*JAIN Imam Bonjol Padang*). Chung, (2000) defined Self-regulated learning as a situation when students are the master of their own study, able to monitor goals and manage resources and make decisions on their own regarding their learning process. Berkhout et al. (2017) stated that this factor is a person-context interactive process which requires a supportive learning environment. Higher education institutions can deliver study planning workshops which consist of learning planning and strategies, learning monitoring and evaluation for first year students. Higher education institutions should also create a supportive learning environment for students.

Metacognitive competence (B-1-6) has an effect on Academic Achievement. Yuliyanti (2015) and Zurimi & Dahlan (2016) found that metacognitive competence has a positive significant correlation with GPA. (Yuliyanti, 2015) conducted research on 60 Nursing major students from Bhakti Mulia Health Polytechnic, Sukoharjo. Zurimi & Dahlan (2016) conducted research on 214 students from the Faculty of Education of Darussalam Ambon University (UNIDAR), Ambon. Terrace & Son (2009) defined Metacognition as "knowledge about knowledge"

Autonomous Learning (B-1-7) has an effect on Academic Achievement. Rahmi et al. (2017) found that autonomous learning has a positive significant correlation with GPA. Rahmi et al. (2017) conducted research on 67 Chemistry Education major students from Syiah Kuala University (UNSYIAH), Banda Aceh. Horváth (2007) defined Autonomous Learning as "a conscious effort on the part of the learner to continuously monitor the learning process from beginning to end." This definition is very similar with how Chung (2000) describes Self-regulated learning. It is possible that these two factors are identical or at least has several overlapping features.

Learning Behavior (B-1-8) has an effect on Academic Achievement. Madhuri (2017) found that learning behaviour has a positive significant correlation with GPA. Madhuri (2017) conducted research on 221 Accounting majors students from State University of Surabaya (UNESA), Surabaya. Praditsang & Hanafi (2015) stated that Learning Behavior is how students learn in an openly way, which can be understood by others, and in ways which only their own mind can understand.

Learning Anxiety (B-1-9) has an effect on Academic Achievement. Zurimi & Dahlan (2016), Hasibuan & Riyandi (2019) found that learning anxiety has a negative significant correlation with GPA. Zurimi & Dahlan (2016) conducted research on 214 students from the Faculty of Education of Darussalam Ambon University (UNIDAR), Ambon. Hasibuan & Riyandi (2019) conducted research on 104 students from the Faculty of Medicine of Muhammadiyah University of Sumatera Utara (UMSU). Vitasari et al. (2010) stated that study anxiety happened because low study motivation, insufficient skills, courses misperception, and bad experience in previous courses.

Self-concept (B-1-10) has an effect on Academic Achievement. Zurimi & Dahlan (2016) found that self-concept has a positive significant correlation with GPA. Zurimi & Dahlan (2016) conducted research on 214 students from the Faculty of Education of Darussalam Ambon University (UNIDAR), Ambon. (Gisbert & Font, 2008) defined Self-concept in the education context as how students construct themselves as learners in a school setting, both in term of skills and shortcomings.

Intellectual Intelligence (B-2-1) has an effect on Academic Achievement. Silen (2014), (Rosita et al. (2015) found that intellectual intelligence has a positive significant correlation with GPA. Silen (2014) conducted research on 78 students from the Semarang Merchant Marine Polytechnic, Semarang. Rosita et al. (2015) conducted research on 114 students from the Faculty of Medicine of Muhammadiyah University of Palembang (UMP), Palembang. (Neagoe, 2018) defined Intellectual Intelligence as a combination of related mental abilities in several categories, such as memory, numerical, and

spatial abilities. (Au et al., 2015) found that cognitive training have positive effects on cognitive functions. Higher Education Institutions can deliver cognitive / brain training workshops to improve student cognitive functions.

Emotional Intelligence (B-2-2) has an effect on Academic Achievement. Silen (2014), Zurimi & Dahlan (2016), Madhuri (2017) found that emotional intelligence has a positive significant correlation with GPA. Silen (2014) conducted research on 78 students from the Semarang Merchant Marine Polytechnic, Semarang. Zurimi & Dahlan (2016) conducted research on 214 students from the Faculty of Education of Darussalam Ambon University (UNIDAR), Ambon. Madhuri (2017) conducted research on 221 Accounting majors students from State University of Surabaya (UNESA), Surabaya. (Preeti, 2013) defined Emotional intelligence as part of social intelligence that allows a student to monitor the feelings on one's own and others which allows student to interact with others in a productive way.

Spiritual Intelligence (B-2-3) has an effect on Academic Achievement. Silen (2014), Madhuri (2017) found that spiritual intelligence has a positive significant correlation with GPA. Silen (2014) conducted research on 78 students from the Semarang Merchant Marine Polytechnic, Semarang. Madhuri (2017) conducted research on 221 Accounting majors students from State University of Surabaya (UNESA), Surabaya. Emmons (2000) stated that spiritual intelligence has five components: capacity for transcendence, heightened consciousness, ability to conduct activities with a sense of the sacred, utilization of spiritual resources for problem solving, and virtuous behaviour.

Interpersonal communication skills (B-3-1) has an effect on Academic Achievement. Ariyani & Hadiani (2020) found that interpersonal communication skills has a significant correlation with GPA. Ariyani & Hadiani (2020) conducted research on 88 students of Bandung Manufacturing Polytechnic (*Polman Bandung*).

Communication Anxiety (B-3-2) has an effect on Academic Achievement. Sofyan et al. (2015) found that communication anxiety has a significant correlation with GPA. Sofyan et al. (2015) conducted research on 60 Biology Education major students from Alauddin State Islamic University of Makassar (*UIN Alauddin Makassar*).

Social media addiction (B-3-3) has an effect on Academic Achievement. (Anshori et al., 2019) found that social media addiction has a negative significant correlation with GPA. Anshori et al. (2019) conducted research on Islamic Education major students from Islamic University of Malang (UNISMA), Malang.

Physical Condition (B-4-1) has an effect on Academic Achievement. (Oktavianingtyas, 2013), Welong et al. (2020) found that physical condition has a significant correlation with GPA. Oktavianingtyas (2013) conducted research on 178 Mathematics Education major students from University of Jember (UNEJ), Jember. Welong et al. (2020) conducted research on 60 Health and Safety major students from Sam Ratulangi University (UNSRAT), Manado. (Oktavianingtyas, 2013) and Welong et al. (2020) used a different variable on this factor. Oktavianingtyas (2013) used a general term of physical condition which encompassed all aspect of physical condition while Welong et al. (2020) used Physical Activity and Fatigue.

Active participation in student organizations (B-5-1) has an effect on Academic Achievement. Efendi et al. (2020) found that active participation in student organization has a significant correlation with GPA. Efendi et al. (2020) conducted research on 40 students from the Faculty of Medicine of Lampung University (UNILA).

Active participation in society (B-5-2) has an effect on Academic Achievement. Agustine et al. (2014) found that active participation in society has a significant correlation with GPA. Agustine et al. (2014) conducted research on 188 Nursing major students from Kupang Health Polytechnic, Waingapu Campus

Circle of friends (B-5-3) has an effect on Academic Achievement. Agustine et al. (2014) found that circle of friends has a significant correlation with GPA. Agustine et al. (2014) conducted research on 188 Nursing major students from Kupang Health Polytechnic, Waingapu Campus

4.3. Lecturer and Learning Environment-related Factors

Lecturer Competency (C-1) has an effect on Academic Achievement. Suarjana & Yintayani (2017), Jani (2020) found that Lecturer Competency has a significant correlation with GPA. Suarjana & Yintayani (2017) conducted research on 100 Accounting major students from Bali State Polytechnic (PNB), Bali. (Jani, 2020) conducted research on 170 students from the Faculty of Education of Tulungagung State Institute for Islamic Studies (IAIN Tulungagung), Tulungagung.

Lecturer Teaching Style (C-2) has an effect on Academic Achievement. Silfiyani & Hariyati (2018) found that Lecturer Teaching Style has a significant correlation with GPA. Silfiyani & Hariyati (2018) conducted research on 185 Education Management major students from State University of Surabaya (UNESA), Surabaya.

Variation in lecturing methods (C-3) has an effect on Academic Achievement. Jani (2020) found that variation in lecturing methods has a significant correlation with GPA. Jani (2020) conducted research on 170 students from the Faculty of Education of Tulungagung State Institute for Islamic Studies (IAIN Tulungagung), Tulungagung.

Learning Environment (C-4) has an effect on Academic Achievement. Oktavianingtyas (2013), Sudirman (2015), Yuliyanti (2015) found that learning environment has a significant correlation with GPA. Oktavianingtyas (2013) conducted research on 178 Mathematics Education major students from University of Jember (UNEJ), Jember. Sudirman (2015) conducted research on 150 Islamic Studies major students from Imam Bonjol Padang State Institute for Islamic Studies (IAIN Imam Bonjol Padang). Yuliyanti (2015) conducted research on 60 Nursing major students from Bhakti Mulia Health Polytechnic, Sukoharjo.

4.4. Development Initiatives that Can Be Conducted by Higher Education Institutions

Based on the analysis of factors, this study developed several development initiatives that Higher Education Institutions can do in order to improve students' academic achievement, as can be seen in table 3.

Tabel 3. Development Initiatives for Higher Education Institutions

Code	Factor	Development Initiatives
A-1	Parent Level of Education	Conduct detailed researches on what kind of knowledge and information that continuing generation college students normally received from their parents which made them better at academic achievement than the first generation college students. Higher education institutions can then conduct special counselling sessions for first generation college students which contains knowledge and information that continuing generation college students normally have. The objective is to close the knowledge gap between the two groups.
A-2	Socioeconomic Status	Students from low-income families usually do not have sufficient learning facilities at home, such as laptops and broadband internet access. Higher education institutions can provide public computers and broadband internet access on campus facilities. In order to make sure that the quantity is sufficient, higher education institutions can make a survey on how many students that do not have sufficient learning facilities at home and whether they are going to use campus facilities if campus provides them.
A-3	Working while Attending College	Higher education institutions can inform students that GPA matters in getting a job in the Industry 4.0 era. Students should be able to balance their job with their study. Higher education institutions can deliver time management workshops for all students to address this matter.
A-4	Gender	Female students, on average, achieved better GPA than their male counterpart is because of their better planning skills and focus. Higher education institutions can deliver study planning workshops for all students to address this matter.
B-1-1	Self-Efficacy	Higher Education Institutions can deliver confidence building workshops for first year students to increase self-efficacy of their students.
B-1-2	Learning Interest	Higher Education Institutions can conduct Interest and Aptitude test during admission process in order to make sure that the students are interested to study in the major that the students choose.
B-1-3	Learning Motivation	Higher Education Institutions can deliver motivation seminars for first year students to increase learning motivation of their students.
B-1-4	Learning Attitude	Higher Education Institutions can deliver special introductory sessions for first year students in the first months of their study in order to make them more interested in learning the courses in their respective majors. These sessions should consist of career outcomes, industry visits, and inspiring stories on

		how certain methods were actually implemented in industries. Understanding the benefits of studying in their respective majors from the beginning will help students shape a good learning attitude.
B-1-5	Self-regulated Learning Metacognitive Competence	Higher education institutions can deliver study planning workshops which consist of learning planning and strategies, learning monitoring and evaluation for first year students.
B-1-6	Autonomous Learning Learning Behavior	
B-1-7		
B-1-8		
B-1-9	Learning Anxiety	Higher education institutions can deliver seminars on how to manage learning anxiety for first year students.
B-1-10	Self-concept	Higher Education Institutions can deliver self-development workshops for first year students to help students build a good self-concept.
B-2-1	Intellectual Intelligence	Higher Education Institutions can deliver cognitive / brain training workshops for first year students.
B-2-2	Emotional Intelligence	Higher Education Institutions can deliver emotional intelligence workshops for first year students.
B-2-3	Spiritual Intelligence	Higher Education Institutions can deliver spiritual intelligence workshops for first year students.
B-3-1	Interpersonal Communication Skills	Higher Education Institutions can deliver seminars on interpersonal communication skills for first year students.
B-3-2	Communication Anxiety	Higher Education Institutions can deliver seminars on communication skills for first year students to decrease communication anxiety.
B-3-3	Social Media Addiction	Higher Education Institutions can deliver seminars on the effects of social media addiction for first year students in order to make students understand its effect on their academic achievement. Higher Education Institutions can also utilize social media as a learning platform.
B-4-1	Physical Condition	Higher Education Institutions can encourage students to join student sport clubs in order to maintain good physical condition.
B-5-1	Active Participation in Student Organizations	Higher Education Institutions can encourage students to join student organizations.
B-5-2	Active Participation in Society	Higher Education Institutions can encourage students to be involved in society, such as being active in their local community or by being a volunteer for Higher Education Institution Community Service Activity.
B-5-3	Circle of Friends	Higher Education Institutions can deliver seminars on the effects of circle of friends for first year students in order to make students understand its effect on their academic achievement. The main goal is to make them consciously understand that their choice of friends will influence their study and their academic achievement.
C-1	Lecturer Competency	Higher Education Institutions can deliver trainings for lecturers to improve their competency.
C-2	Lecturer Teaching Style	Higher Education Institutions can deliver trainings for lecturers to train lecturers in good teaching styles.
C-3	Variation in Lecturing Methods	Higher Education Institutions can deliver trainings for lecturers to train lecturers in various lecturing methods.
C-4	Learning Environment (Physical & Social)	Higher Education Institutions can conduct detailed research on the condition of campus learning environment, especially on how students learn and interact in the campus environment. Based on the results, changes and modifications on the learning environment can be implemented to create a better learning atmosphere in campus.

5. Conclusion

Through literature review method, this study has found 28 factors affecting academic achievement of Indonesian Higher Education Institution students in the era of Industry 4.0. Analysis of these factors were conducted in this study. This study also developed initiatives that can be conducted by Higher Educations Institutions in Indonesia to improve student's academic achievement.

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