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Measurement of Generic Skills of Students: A Systematic Literature Review

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Abstract: One of the talents that students must have to face rapidly developing global problems is generic skills. Therefore, it becomes important to measure generic skills in students. The method used in this study is a systematic literature review using the PRISMA diagram. The database used to search for literature utilized two digital libraries, namely Google Scholar and Scopus. In order to make the selected literature relevant, the search used the keyword "generic skills". Furthermore, screening was carried out to obtain scientific article publications from 2010 to 2023 that discuss generic skills. The results of the search for scientific articles contained thirty articles that would be analyzed and synthesized. The analysis technique used is the narrative method by grouping the extracted data. This study is expected to collect student generic skills measurement instruments.

Keywords: Generic skills; Measurement; Talents

Introduction

The government expressed concern over the employability of higher education graduates in taking responsibility for fostering and developing a range of student competencies, which include generic skills, values, and work-related attitudes that are beyond disciplinary knowledge. These generic skills include several skills, such as critical thinking, problem solving, communication, values, attitudes of respect for others, and intercultural awareness. These generic skills can be implemented across disciplines and professions, as well as in life and study. Generic skills are important for holistic human development. Despite efforts to promote the importance of generic skills and incorporate them in curriculum reforms around the world, negative attitudes of teachers and students have hindered the development and implementation of generic skills in higher education (Chan & Fong, 2018).

Another challenge faced is the development of generic skills and their implementation regarding assessment issues. Although generic skills are sometimes embedded in disciplines and curricula, these are rarely assessed and reported (Badcock et al., 2010; Drummond et al., 1998) as outcomes of individual learning, but these are more holistic in disciplinary knowledge. Students may not even be aware of the generic skills they are developing in their classes as hidden in the curriculum (Hughes & Barrie, 2010).

As argued by Hughes et al. (2010), although traditional forms of assessment, such as essays and exams are not always easily adapted to assess generic skills as there is resistance to assessment innovation among teachers and students. This needs to be addressed by developing academics' understanding and expertise in assessment and involving students in the assessment process and encouraging them to take a more active role in directing and reflecting on their own learning. Concerning that the teaching of generic skills is typically context dependent, translating generic skills assessment into discipline-specific forms also presents challenges (Hughes & Barrie, 2010; Jackson, 2013). Students eventually lose interest in developing generic skills and create situations where students only learn skills for assessment (CKY Chan, 2012). In many East Asian countries with an exam-oriented culture, students

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are only taught what they will do to be assessed in school (Leung et al., 2014) and this suggests a need for generic skills assessment to encourage students to take generic skills learning more seriously (Hughes & Barrie, 2010).

Research conducted by several international organizations has concluded that the assessment of generic skills, where students' language and culture may have an impact on the assessment approaches and testing systems currently used in education do not reflect the actual level of students' generic skills (Diane, et al., 1977). In other words, how generic skills are defined will have a direct impact on how they are assessed. The lack of clarity regarding the conceptualization or definition of generic skills ultimately creates obstacles to other aspects of the generic skills agenda, such as curriculum, pedagogy, and assessment (Hammer et al., 2009).

On the students' part, there is also a less favorable response to the development of generic skills. Meanwhile, adult students tend to focus on achievement in traditional academic terms, younger students do not have the confidence to go beyond their discipline or do not know what generic skills are important to them (Dunne et al., 1997). Although generic skills are designed to be an integral part of their disciplinary learning and they themselves are aware of its importance, their studies do not effectively develop their generic skills (De La Harpe et al., 2000). Therefore, it becomes a challenge to convince students to truly engage with generic skills in their development.

Carew (2007) held three regional forums in Australia in which academics and faculty leaders in Engineering were invited to share their experiences and challenges in ideas for curriculum reform. From discussions in forums, they concluded that there is a need for appropriate teaching and learning strategies that will stimulate students' self-motivation, independent thinking, and deep intellectual inquiry which are fundamental for the authentic development of generic skills throughout their studies (Carew, 2007). Rigid learning in Asia is that academic knowledge is the most important outcome of education and also encourages students to focus on academic achievement at the expense of holistic human development. The difficulties in assessing generic skills that have been discussed previously, such as a lack of systematic and standardized assessment approaches (Hughes & Barrie, 2010) have left students behind due to unclear goals and expectations regarding the development of generic skills, and also present barriers to students incorporating generic skills into the curriculum (Murdoch-Eaton & Whittle, 2012).

Project-based Integrative Model (PBIM) is suitable for analyzing the generic skills of students in Indonesia. This is because PBIM requires students to be responsible and complete realistic tasks by collecting information independently by changing and building knowledge (Dee Fink, 2009). Many Islamic High School or *Madrasah Aliah (MA)* in Indonesia have implemented PBIM (Husin, 2018; Khabibah et al., 2017; Mulyani et al., 2016). PBIM seeks to closely integrate theory and practice in education. This integration usually appears in interactive and project-based learning. In this regard, theory and practice will be integrated. This model is based on interaction, conceptualization of practical situations, and reflection on what has been learned. Teaching, learning, and guidance blend into each other and coaching in PBIM is a natural part of a teacher's work, including tutoring (Jääskelä et al., 2018).

Method

The articles used in this literature review are articles obtained using Google Scholar and Scopus. A search for research literature relevant to this research topic was carried out with the keyword "generic skills". A literature search was carried out on October 2023. The articles were then sorted according to the research topic so that thirty research articles were collected, which were considered to be representative of all research articles on measuring students' generic skills. The narrative method aims to describe the measurement of students' generic skills.

Results and Discussion

Based on a literature review (Crawford et al., 2021; Kuzminov et al., 2019; Okolie et al., 2020; Pitan, 2017), it shows that the importance of generic skills in the world of work must be prepared from students at school although according to old research that pedagogy, curriculum, student experience, learning strategies, conception, mission of higher education, and compliance do not improve students' generic skills (CKY Chan et al., 2017). Human capital theory in recent decades has become the basis of education policy in many developed countries. However, expert discussions often underestimate the research findings and developments related to this theory that since the 1970s have consistently enriched the understanding of how human capital contributes to personal well-being and the socioeconomic development of society as a whole. Education policy has left behind to the explanation above, resulting in a reduction in the impact of education on development throughout the world. In the 21st century, fundamentally new trends in socioeconomic dynamics present unprecedented challenges for education systems throughout the world,

including Russia. Although the amount of money and time spent on education has increased quantitatively, the performance per unit cost of education has decreased. Human potential, created by education, faces more and more difficulties in its utilization: economic growth is slowing down both at the country and global level. This situation has given rise to new efforts to argue that education is not important for economic growth and individual success. So far, these efforts have not had much influence on education policy, but in many countries, this kind of arguments have become the background for budget decisions that are detrimental to education. The education system needs to equip practices that contribute to human resource development. In this regard, some theoretical explanations that have not been part of the mainstream discussion regarding human resources, can help to understand the role of human resources in socio-economic progress and possible ways to improve it in the short and long term.

In an effort to address this situation, it is important to conceptualize generic skills and find the reason why universities have a problem with teaching generic skills in their programs. Several factors that contribute to this include poor learning environments, a lack of staff with industry experience, and an over-reliance on teaching theoretical content. The findings are important for reorienting higher education curriculum developers to align with the needs of industry and society.

Development of Generic Skills Modules

Based on a literature review (Khoiri, 2023), the component developed in this research is an earth and space science practicum module format. There is material found in the content section, namely the theoretical basis according to the subject matter. The content characteristics of teaching materials consist of guidelines for using practical modules, experiment titles, practical objectives, theoretical basis, tools and practical materials, work steps, as well as discussions and conclusions based on generic science skills.

The development research model used in developing this module is the ADDIE Model. This model provides the opportunity to evaluate development activities at each stage. This model consists of five steps, namely analysis, design, development, implementation, and evaluation.

Attributes that Enhance Generic Skills

Learning Management System (LMS)

LMS is a software application for the administration, documentation, tracking, reporting, and delivery of course education. Some of the benefits of using an LMS for students are content organization, anytime and anywhere access with a computer, communication with other students or teachers, and easy tracking of student progress. LMS consists of several modules such as exams, assignments, forums, and workshops. Teachers configure and adapt these modules to course needs and student interactions. Several articles can be found in the literature where teachers ensure that their students perform generic skills while working on LMS modules. For example, there is a correlation between students' activities in the LMS and the grades they achieve (Balderas et al., 2018).

Interdisciplinary Curriculum

Based on a literature review by Chan et al. (2018), this study has investigated and compared the perceptions of generic skills of first-year engineering students and business students at a university in Hong Kong. A total of 502 students consisting of 251 students from each discipline assessed the importance of general skills for their future careers as well as the level of competence they have felt in these competencies. Some significant differences have been found between students from engineering and business disciplines in their perceptions of the importance of generic skills.

A further study could also be conducted to investigate whether there is a change in students' perceptions of the importance of generic skill differentiation heading into their final year as they will be studying in their selected field for a much longer period of time. A longitudinal study following the same students from their first year to their final year of study could also be conducted to find out whether their perceptions of generic skills change. In order to inform curriculum design for generic skills, future research could also investigate further what might encourage students from both engineering and business disciplines to develop generic skills and the possibility of interdisciplinary collaboration. This study shows developing students' generic skills requires alignment of curriculum design, teaching pedagogy, and student attitudes and motivation.

Discovery Learning Model

Discovery learning-based modules are effective for improving generic science skills because the results of statistical analysis tests show that there is a significant difference between the posttest control class group, which commonly uses modules in schools and the treatment class group which utilizes discovery learning-based modules (Khabibah et al., 2017).

Problem Based Learning (PBL)

Many educators are constantly seeking new and better teaching methods, with the aim of improving their students' real-world applicable skills. However, university programs aimed at developing such skills are

not common practice and universities still operate as archaic systems of pedagogical knowledge. Therefore, university programs have been created that encourage the development of skills, such as critical thinking, teamwork skills, as well as incentives that motivate educators to apply teaching techniques, which have been proven to achieve the goals mentioned above to improve generic skills (Klegeris, 2021; Klegeris et al., 2017).

Information and Communication Technology (ICT)

Based on the results of the implementing chemistry learning using ICT-based media on the topic of osmotic pressure and the factors influencing reaction rates, it can be concluded that learning using ICT-based media has succeeded in providing the comparable effect as laboratory-based generic science skills learning. The use of ICT-based media is better used to replace laboratories for schools that do not have facilities to improve indicators of generic science skills (Mulyani et al., 2016).

Extracurricular Activities

The use of extracurricular activities for developing generic skills for students must be interpreted carefully. Future studies should include the voices and opinions of all stakeholders to explore how they view the importance of extracurricular activities and ascertain whether extracurricular activities are conducive to the development of students' generic skills and to what extent generic skills can develop through such activities (Nghia, 2017).

Pedagogical Practice

This research examines what types of pedagogical practices are behind the learning of generic skills. It was found that learning these skills did not depend on a single teaching method or particular pedagogical practice. In contrast, learning generic skills demands the use of a variety of teaching methods and the utilization of different pedagogical practices (Virtanen & Tynjälä, 2019).

Guided Inquiry Learning Model

Based on data analysis of the influence of the guided inquiry-based physics learning model on students' generic science skills, it was concluded that the guided inquiry learning model had an influence on students' generic science skills in thermodynamics material (Erni Mariana et al., 2023).

Learning Cycle Model

The conclusion of the research (Rosyiidah, 2023) is the 7E learning cycle assisted learning model of *Tarsia Puzzle* can improve students' generic science skills.

Project-Based Integrated Learning

Based on the results and discussion (Ratnasari, et al., 2023), it can be concluded that integrated learning tools based on STEM projects on temperature and heat material are feasible (valid and reliable) for increasing students' creativity and generic science skills.

Video Learning Media

Based on the results of research (Saputri et al., 2023) which was conducted at SMAN 1 Madat, it can be concluded that there is an influence of practicum-based video learning media on students' generic science skills in Newton's law material.

Constructivist Learning

The development of physics teaching aids based on constructivism can enhance students' science skills in static fluid material, as demonstrated by an increase in the average final exam score. Students' science skills can be built using the development of constructivism-based physics teaching aids, as shown in the N-gain percentage. In addition, students provided a positive response in the good category in developing constructivism-based physics teaching aids (Ardiansyah et al., 2023).

Contextual Approach Learning

Based on a literature review of twenty-two scientific articles, it can be concluded that the contextual approach applied in science learning in middle and high school has obtained different results, where most of the contextual approach influences students' learning outcomes, motivation and interest in learning. Then, the type of research that is widely used is quasi experimental research. There are several studies conducted in the low category. This is caused by factors caused by the comparison of approaches used and the existence of misconceptions. As a result, the contextual approach is able to improve students' generic science skills (Azizah et al., 2022).

Development of Generic Skills Instruments

Non-Test Instruments

Pedagogical practices have an influence on generic skills (decision-making skills, creativity skills, and problem-solving skills) (Virtanen & Tynjälä, 2019). Four dimensions are used to measure generic skills students understand generic skills, development of generic skills in the academic curriculum, development of generic skills in non-academic learning environments, and development of generic skills assessments (WSC Chan, 2010). Four models to represent generic skills development include (1) Specialist Model, (2) Science-Based Renewal Model, (3) Project-Based Integrative

Model, and (4) Network Culture Model (Jääskelä et al., 2018).

Seven attributes measure students' generic skills: problem solving, critical thinking, creative thinking, oral and written communication, social interaction, ethical decision making, and global perspective (Kong et al., 2017). Generic skills include information handling skills, learning management, communication and presentation, the importance of computer skills, critical thinking, and problem solving (McLean et al., 2013). Indicators measuring students' generic skills: religious moderation, critical and creative thinking skills, and interpersonal skills (Makhshun et al., 2023).

Test Instrument

The initial student ability test instruments developed consisted of scholastic tests in the form of verbal and numerical reasoning tests as well as chemistry tests as an evaluation of learning outcomes, which were prepared using the 4D development model. The student's initial ability test instrument is adjusted to the generic science skill indicators in the learning objectives of chemical equilibrium material. The initial ability test instrument in the form of a scholastic test can support the achievement of learning achievement evaluation tests (Chemistry) in each chemical equilibrium subject because the two tests developed are related to each other. The initial ability test instrument based on generic science skills that was developed has met content validity and construct validity and is suitable for use to measure students' initial abilities.

Conclusion

The analysis of the entire article indicates that generic skills are really necessary for life. This review collects various attribute studies that can improve generic skills and generic skills measurement instruments. For future researchers, literature review can be carried out by focusing on areas that are more focused on certain instruments or contexts so that the results obtained can be more focused.

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Author Contributions

Conceptualization: S.M, Y.S.S, A.S data curation S.M, Y.S.S, A.S. funding acquisition: AL methodology: S.M, Y.S.S, A.S. visualization: AL. writing–original draft: S.M, Y.S.S, A.S. writing – review & editing: S.M, Y.S.S, A.S.

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Conflicts of Interest

No conflicts of interest.

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