Indonesian Journal of Learning Education and Counseling
Website: https://journal.ilininstitute.com/index.php/IJoLEC
Vol 8, No 1, 2025, pp 66-76
p-ISSN:2622-8068 and e-ISSN: 2622-8076

Development and Validation of an Augmented Reality-Based Career Card Game for Student Career Guidance

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Artikel info

Article history:
Received: 20-07-2025
Revised: 21-08-2025
Accepted: 28-09-2025
Publish: 27-09-2025

DOI:
doi.org/10.31960/ijolec.V8i1.3138

Abstract. This study aims to develop and evaluate augmented reality-based career card games as a career information tool for high school students. The research method uses a modified Borg & Gall research and development model, with stages including needs analysis, product design, expert validation, and practicality testing. Data were obtained through questionnaires and interviews, then analyzed descriptively and quantitatively. The results showed that students need career guidance media that is more interesting, interactive, and technology-based. The AR Career Explorer product was declared highly valid and practical by experts, guidance counselors, and students. The novelty of this study lies in the integration of Holland's theory with AR technology in the form of a card game, which has not been found in previous studies. This media is suitable for use as an innovative alternative to improve career information services in high schools.

Keywords:
Augmented Reality;
Career Guidance;
Educational Game;
High School Students;

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INTRODUCTION

Career planning is a crucial aspect of education, as it helps students recognize their potential, understand job opportunities, and develop career directions that are consistent with their interests and talents. In a global context, effective career planning has been proven to increase students' readiness to face increasingly competitive job market dynamics (Nwakanma, 2024). However, in Indonesia, serious challenges still arise, one of which is the high rate of youth unemployment. Data from the Central Statistics Agency (BPS, 2024) shows that the open unemployment rate in the 15-24 age group reaches more than 18%, a figure that confirms the low career readiness of the younger generation. This condition is influenced by limited access to career information, weak interest exploration,

and career counseling services that tend to be conventional.

Along with the development of the digital era, the use of information and communication technology in education has emerged as an urgent need. The existence of ICT not only enriches the learning experience in a more interactive and innovative way, but also plays a role in supporting the career decision-making process in a more systematic manner. This condition is very crucial, considering that students need to be prepared to face the increasingly fierce competition in the global world of work (Sutoyo et al., 2023).

Among the rapidly growing technologies, augmented reality (AR) is seen as one of the promising innovations in career guidance services. This technology has been proven to increase student engagement and expand their understanding of the various career options available. A number of studies show that the application of AR in the context of education can produce a more interesting, in-depth, and relevant learning experience to the needs of the world of work. Thus, students can more easily adapt to the increasingly complex dynamics of the job market (Krishnaveti et al., 2025).

Furthermore, the important role of self-understanding and field of study selection in the career planning process was also emphasized in Zhao and Wu's research. They highlight that career education that utilizes technology is able to strengthen students' readiness to face the challenges of the modern world of work (Zhao & Wu, 2022). The study confirms that the success of career planning is strongly influenced by access to the right information and adequate counseling services. Unfortunately, in Indonesia there are still obstacles in the form of high unemployment rates among teenagers. One of the main causes is limited access to career information and the lack of optimal counseling services available (Du et al., 2024).

These problems show that there is an urgent need to bring innovation in career guidance practices. These efforts are not enough to stop at providing information, but must also include strategies that can increase students' motivation, engagement, and independence in designing their careers (Small et al., 2022). The development of this kind of service is becoming increasingly important in the midst of the current job market dynamics, where skills, knowledge, and personal competence are considered as the main capital in achieving success (Hashish & Bajbeir, 2022).

Within this framework, career education can be comprehensively designed by integrating various aspects, including direct intervention and the use of technology, in order to facilitate a more effective career planning process. This kind of approach will prepare students to be more adaptive in dealing with rapid changes in the work environment (Zhou et al., 2025). Ultimately, the integration of technology-based career education can encourage the development of students' confidence and independence in designing their futures. With these provisions, they will be better prepared to compete and adapt in a job market that is full of challenges while continuing to grow (Salazar et al., 2022).

Based on interviews conducted with guidance and counseling teachers at SMA Negeri 5 Makassar, it indicates that students are still confused in determining the right career direction. This is triggered by the limitations of comprehensive career information and the lack of innovative supporting media. Existing services tend to be conventional, monotonous, and have not been able to facilitate career exploration effectively or interactively.

A number of previous studies have focused on the development of career card media as one of the supporting instruments for guidance services (Bagaskara & Rosada, 2021), as well as the application *of augmented reality* in learning to increase student interactivity (Yanuarti & Hariastuti, 2023). However, developments that specifically integrate career card media with AR technology in career guidance services are still limited. This condition shows that there is a *research gap* that needs to be answered, namely through the development of innovative AR-based media that not only presents career information more attractively and accurately, but is also able to provide a meaningful learning experience for students.

Based on this presentation, the development of career guidance media that combines career cards with *augmented reality* technology is an innovation that has novelty value. This research has novelty in the integration of Holland theory (RIASEC) with

AR technology in the form of career card games. This media is expected to provide a more interactive, valid, and practical learning experience in supporting career guidance services in schools. Therefore, this study specifically aims to develop a valid and *practical augmented reality-based* career card game media, so as to increase the effectiveness of career information services for high school students.

METHOD

This research uses a Research and Development (R&D) approach with a modified Borg & Gall model. The selection of this method is based on its suitability in producing educational products as well as evaluating the feasibility and practicality of the product (Sugiono, 2018). The main focus of the research is to produce and test the feasibility of Augmented Reality (AR)-based career card game media.

The procedure for developing this product refers to the seven stages of Borg & Gall (1983) which has been simplified to better suit the research context. The first stage is the collection of initial information, namely by identifying needs through questionnaires and interviews with students and Guidance and Counseling teachers. Next, the second stage is planning, which includes designing career card designs as well as Augmented Reality (AR)-based applications. After that, the third stage is in the form of initial product development, namely the creation of a prototype of AR card media. In the fourth stage, expert validation was carried out through a feasibility test involving guidance and counseling experts and educational technology experts. Based on the results of the validation, the first phase of revision was carried out to improve the product in accordance with the input provided by experts. Next, the sixth stage is a small group trial involving 15 high school students as trial subjects. The last stage is the second phase of revision which produces the final product after improvements are made based on the findings of the trial (Slamet, 2022).

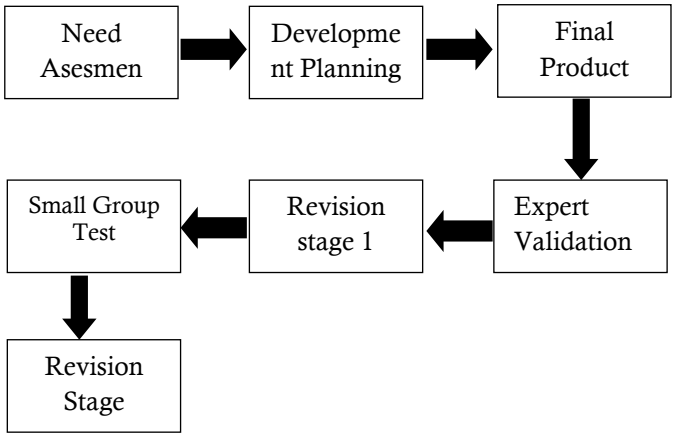

Figure 1. Bord & Gall expansion procedure

The subjects of the study are high school students who are prospective media users. The small group trial was conducted on 15 students selected using purposive sampling with the following criteria: (1) students are at the high school level in grade XI, (2) represent different majors, and (3) are willing to be respondents. This selection is based on the consideration that grade XI students are at the stage of career exploration.

The research instruments used in this development consist of several types according to the purpose of data collection. First, a need assessment questionnaire aimed at students to identify real needs related to the media to be developed. Second, a validation questionnaire given to experts who have competence in the field. The validity process includes an assessment in terms of material and media carried out by four experts from their fields. Third, a practicality questionnaire intended for Guidance and Counseling teachers and students as users, in order to find out the level of convenience, understanding, and usefulness of the product. All of these instruments have gone through a content validity test process by requesting assessments from experts, so that it can be ensured to have good internal consistency and an adequate level of validity in supporting this research.

Data was collected through questionnaires and interviews. Interviews were used to dig into needs information and qualitative feedback, while questionnaires were used to assess the validity and practicality of the product (Creswell & Plano Clark, 2018).

Data analysis was carried out by: (1) Descriptive quantitative: using the feasibility percentage based on the Likert scale to

categorize the level of validity (very valid, quite valid, less valid, invalid) and practicality (very practical, quite practical, less practical, impractical); (2) Descriptive qualitative: the results of the interviews were analyzed using Miles and Hubermen analysis techniques through four stages, namely, data collection, data presentation, data reduction, and conclusion drawing so as to produce argumentative descriptions to identify the main themes related to student needs and product improvement. (Miles, Huberman, & Saldaña, 2014).

RESULTS AND DISCUSSION

1. An overview of the media needs of augmented reality-based career card games as a career information service for students at SMA Negeri 5 Makassar.

Career guidance plays an important role in helping students explore themselves and understand career options that fit their personal characteristics (Sinring & Umar, 2021). This guidance not only supports students in making the right career choices, but also prepares them to adjust to the work environment, so that they are better prepared for the challenges and demands of the future. Career, as an important aspect of skill development, requires individuals to understand themselves, recognize their interests, talents, and potential, identify suitable careers, choose the right path, and design goals that are in line with the career direction they want to achieve.

The results of the needs analysis through a questionnaire distributed to 60 students showed that 37 students had difficulty finding career information that matched their interests and talents, while 41 students still felt confused in planning their future careers. To deepen these findings, researchers conducted interviews with two students at SMA Negeri 5 Makassar. The interview revealed several problems, namely, first, the limitation of career information at school so that it is difficult to understand the job opportunities of the profession of interest, second, the media used by BK teachers is monotonous and tends to be in the form of lectures so that it is less attention-grabbing, third, the need for interactive media so that the career exploration process is more fun and easy to understand.

Furthermore, the analysis of the need for materials and media shows the need to develop guidance and counseling media in the form of games. Opinion (Miftah & Nur Rokhman, 2022) supporting this, by stating that the use of media can increase the attractiveness of students in receiving information and learning. Based on these findings, researchers developed a media in the form of an augmented reality (AR)-based career card. Opinion (Saputra et al., 2023) also supports this approach, stating that interactive and innovative media is able to help students understand career options and increase their enthusiasm and engagement in learning. This is reinforced by (Setyawan, 2022), which explains that AR-based media is effective in attracting students' attention in the introduction of the profession.

2. Prototype of augmented reality-based career card game media as a student career information service at SMA Negeri 5 Makassar

The initial prototype of AR-based career card game media was adjusted to the results of the needs analysis to ensure the suitability of the material with the needs of students. At this stage, the initial concept of media has included design elements such as color selection, typeface, graphic design, and content placement. This media is designed to provide career information based on John Holland's theory (RIASEC), covering a wide range of professions, relevant education levels, job descriptions and responsibilities, skills required, and salary standards for each profession. This media is expected to be an interesting and useful career information service for students.

Figure 2. Career Card View

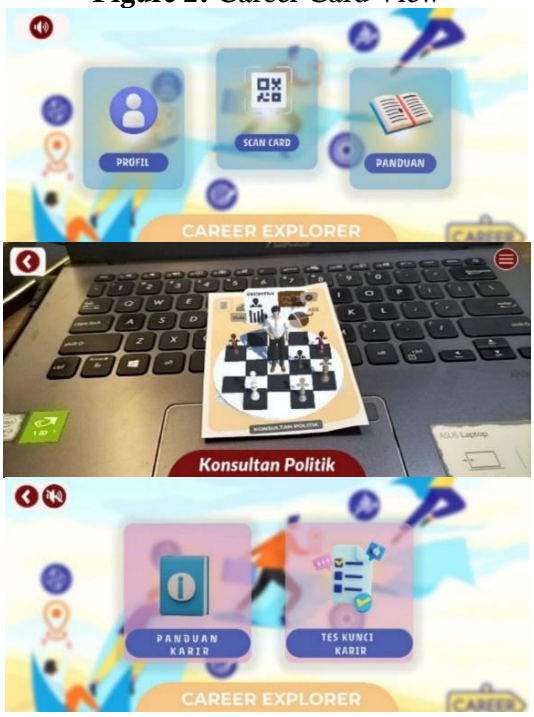

Figure 3. Career Explorer AR App View

3. The level of validity test of augmented reality-based career card game media as a student career information service at SMA Negeri 5 Makassar.

The feasibility of a media can be assessed through a validity test. Validity aims to ascertain the extent to which the product is suitable for use before being tested on the research subject. According to Nieveen, the validity aspect includes two main aspects, namely: content validity (products developed based on current and adequate theories) and construct validity (product components are consistently integrated). In addition to validity, the practicality aspect is also an important indicator, which is assessed based on the ease of use of the product by users, such as lecturers, teachers, and students. Learning media is considered practical if users can operate it easily, multimedia is also considered practical if teachers and students feel comfortable and easy to use (Hafizah, 2023). The following are the results of the validity test of materials and media from the development of AR Career Explorer, in the tabel 1 and table 2.

Table 1. Results of validity tests by subject matter experts

Validator	Ideal Score	Actual Score	percentage	Category
Subject Matter 1	28	28	100%	Highly Valid
Subject Matter 2	28	27	96,4%	Highly Valid
Average Percentage			98,2%	Highly Valid

Table 2. Results of validity tests by media experts

Validator	Ideal Score	Actual Score	percentage	Category
Media Member 1	60	56	93,3%	Highly Valid
Media Member 2	60	59	98,3%	Highly Valid
Average Percentage			95,8%	Highly Valid

From the results of the validation test by material experts with two validators from the guidance and counseling department, it is seen in terms of product feasibility to obtain an overall score from various aspects of indicators, namely 98.2% with a very valid category. Meanwhile, the product development from the results of the media expert validation test that has been carried out with two validators from the Department of Educational Technology is seen in terms of media feasibility with a score of 95.8% with a very valid category.

4. **The level of test of the practicality of augmented reality-based career card game media as a student career information service at SMA Negeri 5 Makassar.**

After a validation test by material and media experts, then an assessment was carried out by BK teachers and students, the following are the results of the AR Career Explorer media practicality test:

Table 3. Practicality test results

Validator	Ideal Score	Actual Score	percentage	Category
BK Teacher	56	53	94,6%	Very Practical
Students (Users)	150	131	87,3%	Very Practical
Average Percentage			90,8%	Very Practical

The practicality test was carried out with a score of 90.8% with very practical criteria. This shows that augmented reality-based career card game media as a student career information service is very practical to be applied in providing career information services at school. BK teachers also gave positive comments on the development of the media that digital media greatly facilitates and supports teachers in delivering career information services, as well as becoming a more attractive medium for students to better understand the material provided, so that the provision of career information services becomes more effective and efficient. Students also gave positive responses to *the AR Career Explorer* media, namely *the AR Career Explorer* media makes it easier for students to get to know their careers better and more fun, *the AR Career Explorer* game also increases the attractiveness of students to learn, and the appearance and size used in *the AR Career Explorer* game are easy to understand.

Discussion

Career guidance services play an important role in the practice of guidance and counseling in schools. Through this service, students are assisted in recognizing their potential, developing interests, and exploring career opportunities that suit their personal capacities and preferences. However, the reality is that there are still many students who experience confusion in determining the direction of their career, mainly due to the limited information they receive. This phenomenon is clearly seen at SMA Negeri 5 Makassar, where most students stated that they have not received comprehensive access to comprehensive information about various profession options and educational paths that are relevant to their needs. This is in line with research conducted by Sinaga and Sa'Adah (2022), which expressed that many students are dissatisfied with the quality of existing career guidance services due to the lack of interactive methods they can access.

This condition supports the results of the research (Fikriyani et al., 2020), which emphasizes that career guidance services have a strategic position in preparing the younger generation to be able to face the dynamics and challenges of the increasingly complex world of work. One of the main challenges in the context of career guidance is the lack of use of interactive media that can attract students' attention. Some research shows that students from the digital native generation are more familiar with technological devices and are looking for a non-monotonous approach to learning. Research by (Putri et al., 2024) emphasizing that interactive learning media can increase students' motivation and interest in engaging in the learning process. If the media used is not able to meet the needs of this generation, then they tend to lose interest and motivation in undergoing the process of career exploration.

From the results of the analysis, it was identified that students tended to show saturation with conventional methods, such as lectures. Research by (Hamidah et al., 2022) shows that the application of innovative learning media can have a positive influence on learning motivation and improve student understanding. In this context, methods that can combine elements of education and entertainment are very important, in order to encourage students to be more active in their career explorations.

As a solution to this need, this research developed AR Career Explorer, which is an augmented reality-based career card game media. The media is designed by

integrating Holland theory (RIASEC) with AR technology, which allows students to not only read the description of the profession, but also witness three-dimensional visualizations of different fields of work. These findings are in line with research by (Aprial & Irman, 2022) which shows that the use of Augmented Reality technology in education can create an interactive and enjoyable learning experience, as well as provide students with the opportunity to experience a hands-on representation of the world of work.

The results of validation conducted by guidance counseling experts and educational media experts show that AR Career Explorer is declared to be in the very valid category. In terms of content, the material is considered to be in accordance with the needs of students and relevant to the career theory used, while from the media aspect, the visual appearance and interactive features are considered attractive, easy to operate, and in accordance with the characteristics of the students. This result strengthens the view (Ridni Eliza et al., 2023), which emphasizes that the validity of content and construction are important benchmarks in determining the feasibility of a learning medium. In addition, in the study (Fajriani et al., 2023), it is also emphasized that the validity of the media can be a determinant of effectiveness in the guidance and counseling process.

Furthermore, a practicality test involving BK teachers and students also showed that this media is classified as very practical to be used in career information services. BK teachers assessed that AR Career Explorer simplifies the process of delivering career information and enriches service methods that have tended to be monotonous, while students admitted that they feel more aroused to explore career information in a more interesting way. This phenomenon is in line with the discovery by (Wibana, 2022), which emphasizes that interactive media can increase motivation and facilitate the understanding of abstract concepts.

The connection between AR Career Explorer and guidance and counseling services in schools is becoming clearer. This product not only functions as an information medium, but also supports BK teachers in providing services more effectively, efficiently, and adaptively to technological developments. This media is able to reduce the time teachers need to convey information manually, so they can focus their energy on more in-depth counseling interventions. Research by (Sujana et al., 2023) It also shows that the adaptation of technology in career guidance is essential to create a comfortable and conducive learning atmosphere for students.

Thus, the development of augmented reality-based career card game media is not only a technological innovation, but also a strategy to strengthen career information services in high school. This media has the potential to increase student engagement, broaden their horizons about the world of work, and help them develop more mature and meaningful career planning, in accordance with the expectations of future education that is inclusive and responsive to the needs of students.

Limitations and direction of further research

Although the results of the study show high validity and practicality, this study has limitations. First, the trial was only carried out in a small group (15 students), so the generalization of the findings was still limited. Second, research has not measured the long-term impact of media on students' career decision-making skills. Third, the research emphasizes more on content validity and practicality, but has not tested its comparative effectiveness with other career media.

For further research, it is recommended to conduct trials with a wider sample, use experimental designs to quantitatively measure the effectiveness of media, and develop more complex gamification features to increase students' intrinsic motivation. In addition, the integration of AR with other technologies such as *virtual reality* (VR) or *artificial intelligence* (AI) can be explored to expand the scope of research in the international realm.

CONCLUSION AND SUGGESTIONS

This research produced an augmented reality-based career card game media (AR Career Explorer) which has proven to be very valid and very practical for use in career information services in schools. The novelty of this research lies in the integration of augmented reality technology with Holland

theory (RIASEC), which presents an innovative approach in career guidance in Indonesia. Theoretically, this research contributes by emphasizing the importance of using career theory as a foundation for the development of digital media to be more contextual and relevant to the needs of students. Practically, this study proves that AR Career Explorer can be an innovative media alternative that makes it easier for BK teachers to convey career information in a more interesting way, while helping students understand the relationship between interests, personalities, and profession choices interactively.

The use of AR Career Explorer media is recommended for guidance and counseling teachers as a supporting media for career information services in schools. Further research is suggested to test the effectiveness of this media on a wider scale with experimental methods, as well as to enrich digital features to be more adaptive to technological developments and student needs in various educational contexts.

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