INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 14, Issue 01, (2025) E-ISSN: 2226-6348

Fostering Entrepreneurial Creativity in Secondary School Students: Integrating Foundational Community Knowledge into Design and Technology Education

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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v14-i1/24655 DOI:10.6007/IJARPED/v14-i1/24655

Published Online: 07 February 2025

Abstract

Previous research introduced an Entrepreneurial Creativity (EC) module to help students market their product ideas but overlooked Foundational Community Knowledge (FCK) in generating community-tailored innovations. Studies suggest that FCK enables students to identify unique local problems, fostering innovation. However, empirical research on FCK's role in EC within Design and Technology (D&T) education remains limited. This study assessed the validity, reliability, and feasibility of a newly developed FCK-based EC module using the ADDIE model. It also examined students' ability to integrate FCK into the five EC stages—Investigation, Ideation, Design, Creation, and Commercialization—through an EC test. Students' foundational community knowledge about *timadang and bambangan* fruit was examined. A descriptive research design was used, evaluating content validity via expert assessors and reliability and feasibility through Likert-scale responses from 30 Form Three students. The findings confirm the module's acceptability and its impact on fostering EC within D&T activities. This study provides a framework for integrating FCK into secondary education to enhance entrepreneurial creativity.

Keywords: Design and Technology, Entrepreneurial Creativity, Foundational Community Knowledge, Secondary School Students

Introduction

Entrepreneurial creativity is increasingly recognized as an important skill for secondary school students. Entrepreneurial creativity helps students understand the broader economic and social context, encouraging them to think about how they can contribute positively to their communities. According to researchers like Mwasalwiba (2010), this understanding is important for nurturing responsible and socially aware future entrepreneurs.

The integration of entrepreneurial creativity is now seen as essential in the Design and Technology (D&T) education to prepare students for potential entrepreneurial paths. This

approach encourages students to think expansively and explore innovative ideas within the D&T learning process (Carella et al., 2022). By cultivating an entrepreneurial mindset, students can engage with D&T in real-world contexts, honing their design skills to compete effectively in a modern economy (Tsupros et al., 2009). Clearly, fostering entrepreneurial creativity in D&T education at the secondary school level is crucial for inspiring students to pursue careers in D&T. This initiative aligns with Malaysia's goal of developing a skilled, entrepreneurial workforce capable of supporting local communities and contributing to economic growth now and in the future.

While modules have been developed to encourage entrepreneurial creative thinking among primary school students (Ahmad & Siew, 2021), there is limited research demonstrating how community-based knowledge can be utilized to foster entrepreneurial creativity in Design and Technology (D&T) curriculum at the secondary school level. This gap exists partly because few learning modules provide a clear framework for integrating community knowledge into the development of entrepreneurial creativity throughout D&T activities. Studies suggest that foundational community knowledge allows students to identify unique problems that need solving, which can spark innovative ideas tailored to their community (Kuratko & Fisher, 2021; Diawati et al., 2023). This raises the question: how can entrepreneurial creativity in secondary school students be developed through the integration of foundational community knowledge into the D&T curriculum?? According to Kuratko and Fisher (2021), integrating foundational community knowledge into the D&T education may enhance students' problem-solving skills crucial for entrepreneurial innovation. Jacobson et al. (2006) describe teaching and learning modules as tools to help students master specific skills or units. This study aimed to develop a teaching and learning module that integrates foundational community knowledge, and to examine its potential in fostering entrepreneurial creativity among secondary school students in Design and Technology (D&T) curriculum.

Many educational systems overlook local and indigenous knowledge. Therefore, integrating foundational community knowledge with Design and Technology is essential to fostering entrepreneurial creativity. This study validates and integrates FCK into formal D&T curriculum, ensuring that traditional skills, techniques, and cultural knowledge are passed down to younger generations. By incorporating FCK, students can design and develop locally relevant solutions to address community-specific needs.

Literature Review

Entrepreneurial Creativity

Rigolizzo and Amabile (2015) identified four stages of entrepreneurial creativity. The first stage, Problem or Opportunity Recognition, involves identifying unmet needs or gaps in the market that can be addressed through innovative products, services, or solutions. The second stage, Preparation, focuses on gathering relevant information, building knowledge, and acquiring the skills necessary to tackle the identified problem or opportunity. This stage lays the groundwork for the creative process. Next is Idea Generation, a highly creative phase where entrepreneurs brainstorm and explore potential solutions or strategies to address the identified need or capitalize on the opportunity. This stage emphasizes creativity and innovation. The final stage, Idea Validation and Implementation, involves testing, refining, and executing ideas to ensure they are practical and viable. Entrepreneurs seek feedback, create prototypes, and make adjustments as needed to bring their ideas to life effectively.

Rigolizzo and Amabile emphasized that these stages are shaped by the individual's learning processes and the support of the learning environment, both of which play key roles in nurturing creativity throughout the entrepreneurial process. Rigolizzo and Amabile's (2015) creative process, however, lacks a dedicated stage for commercialization. Della Corte and Del Gaudio (2017) emphasize that while new ideas or products may have potential, their true value depends on how effectively they are received in the market. To address this gap, the five stages of entrepreneurial creative thinking identified by Arifin and Siew (2023)—Investigation, Ideation, Design, Creation, and Commercialization—are incorporated into Rigolizzo and Amabile's (2015) framework. By integrating a Commercialization stage into the entrepreneurial creativity framework, students are expected to enhance their ability to innovate, create, and apply entrepreneurial principles more effectively.

Foundational Community Knowledge

Foundational Community Knowledge (FCK) is shaped by collective experiences, social norms, and the values that the community holds, which are passed down and reinforced through community practices and language (Bourdieu, 1986; Lave & Wenger, 1991; Rogoff, 2003). Social constructivism, associated with thinkers like Lev Vygotsky, emphasizes that knowledge is not individually possessed but built through communal processes.

Indigenous communities in Sabah, Malaysia have a long history of using *timadang* and *bambangan* fruits for various purposes, whether for food, medicine, or rituals. This knowledge is often passed down through generations, and it's a valuable aspect of community heritage that informs younger generations about their cultural roots.

The *timadang* fruit is native to Sabah, Malaysia, on the island of Borneo. Known for its unique flavor and appearance, it's part of the local biodiversity in the region's rainforests. *Timadang* itself resembles the durian but has distinct differences, such as a milder aroma and a somewhat softer taste profile. Bambangan is another unique fruit from Sabah, Borneo. It's part of the Mangifera family, which means it's a distant relative of the mango, though it has a very distinct flavor and appearance. Both fruits are popular among locals for their flavor and nutritional value, though they are not as widely known. The *timadang* and bambangan fruit is indeed fascinating and beloved among locals in Sabah for its distinctive taste, nutritional value, and cultural significance.

Despite its popularity in local markets, *timadang* and *bambangan* fruit haven't gained much international attention, making it a rare find outside of the region. Like many tropical fruits, *timadang* and *bambangan* are highly perishable, with a short shelf life that complicates storage and transportation. Sellers need to get the fruit to consumers quickly to avoid spoilage, which can be costly.

Therefore, students could absolutely use *timadang* and *bambangan* as a case study to enhance their knowledge of entrepreneurial creativity, applying their learning to address the problems the sellers face. Learning about *timadang* and *bambangan* provide a unique, real-world opportunity to explore the challenges and possibilities of promoting a niche product.

Design and Technology (D&T)

The Design and Technology (D&T) subject for Forms 1-3 builds on the foundational D&T curriculum introduced in Level II of Malaysian primary school. Implemented in secondary schools in 2017 as a replacement for the Integrated Life Skills subject, D&T aims to equip students with essential knowledge, skills, values, aesthetics, and an understanding of technology within the field of design (Curriculum Development Department, 2015). The KSSM Curriculum and Assessment Standard Document for D&T outlines a three-year curriculum for Forms 1 to 3, with a focus on developing students' communication abilities, idea generation, and product design skills. This curriculum encourages students to think critically, creatively, and innovatively, cultivating an entrepreneurial mindset. Design and Technology is emphasized in Malaysia's national education system as a way for students to apply their knowledge and skills through hands-on design activities, ultimately producing functional and practical products.

However, many secondary school students lack exposure to real-world, community-based knowledge, which limits their ability to apply design and technology skills in meaningful ways. As such, there is a need to integrate foundational community knowledge into the Design and Technology curriculum to foster creativity and real-world problem-solving.

Theoretical Framework

The proposed Entrepreneurial Creativity (EC) module, based on Foundational Community Knowledge (FCK), is grounded in Piaget's Cognitive Constructivism (1976) and Vygotsky's Social Constructivism (1978). Piaget believed that knowledge is constructed through active exploration and discovery. This perspective aligns well with entrepreneurship, where creativity often emerges from experimenting with ideas, trial and error, and hands-on problem-solving. Entrepreneurs engage in active learning by testing hypotheses, building prototypes, and exploring solutions, which aligns with Piaget's view of individuals actively constructing knowledge rather than passively receiving it.

Piaget introduced the concepts of assimilation and accommodation, which describe how individuals adapt to new information. Assimilation involves integrating new information into existing frameworks, while accommodation involves modifying existing frameworks to incorporate new insights. In entrepreneurial creativity, these processes are key to evolving ideas. Entrepreneurs assimilate new trends, technologies, or customer feedback into their current understanding, but they also accommodate by reshaping their ideas when facing new challenges, resulting in innovative and adaptive solutions.

Piaget's cognitive constructivism views knowledge construction as a process of solving increasingly complex problems. This resonates with entrepreneurship, where creative solutions often come from overcoming obstacles. Entrepreneurs build on their experiences to solve progressively difficult challenges, developing creative problem-solving abilities as they accumulate knowledge and apply it in novel contexts.

On the other hand, Vygotsky's social constructivism underpins entrepreneurial creativity by emphasizing that creativity develops in social contexts, through interactions, cultural influences, and supported learning processes. Vygotsky's constructivism suggests that an individual's creativity is shaped by their cultural and community context. Entrepreneurs often

draw on the values, norms, and shared knowledge within their communities to inspire new products or solutions. Vygotsky's theory emphasizes the importance of exploration and experimentation, especially within a supportive environment. Entrepreneurs, particularly those in early stages, benefit from environments where experimentation is encouraged, enabling them to test, refine, and iterate on ideas. Social constructivist principles suggest that creative risk-taking can be supported by communities that value innovation and view failure as a learning opportunity.

In designing the FCK-based EC module, researchers adapted the ADDIE model (Branch, 2010). The ADDIE model fosters innovative thinking at every stage—Analyze, Design, Develop, Implement, and Evaluate—by encouraging entrepreneurial creativity through Rigolizzo and Amabile's (2015) model, and Arifin and Siew (2023) entrepreneurial creative thinking to create effective learning experiences. The theoretical framework for the FCK-based EC module is shown in Figure 1.

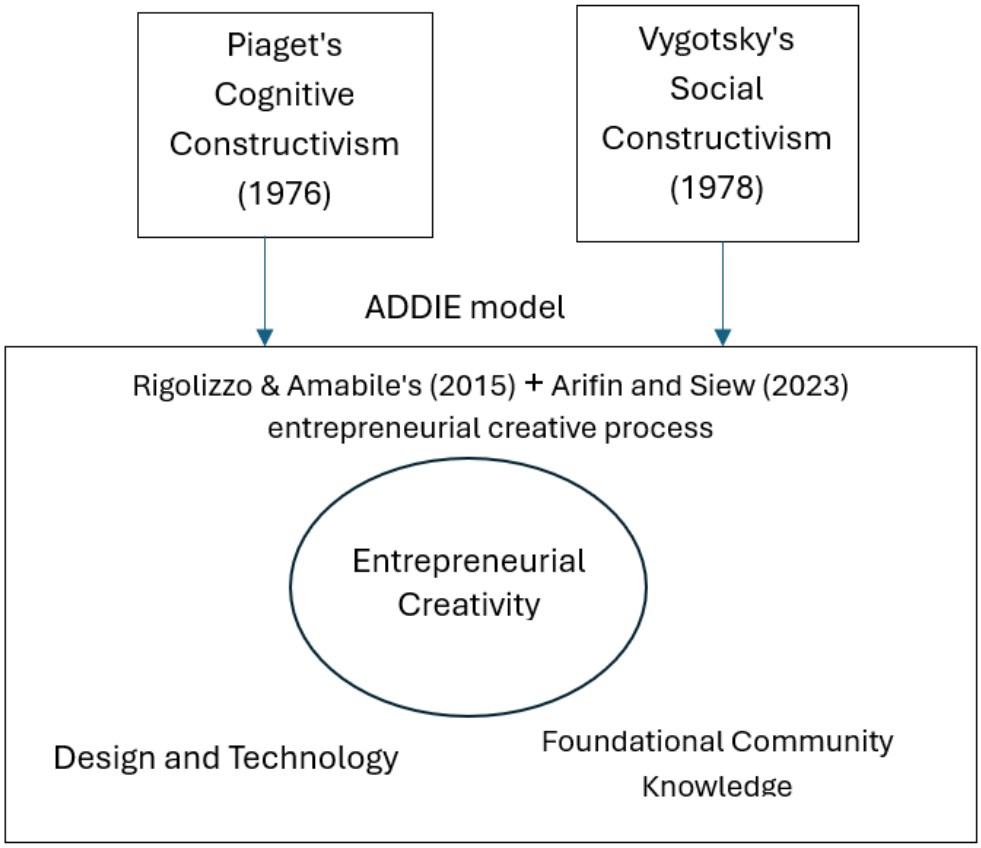

Figure 1
Theoretical Framework of the Study

Research Question
The primary research questions of this research are:
1. How valid, reliable and feasible is the developed teaching and learning module for integrating foundational community knowledge into Design and Technology (D&T) education?
2. How does the integration of foundational community knowledge influence secondary

school students' entrepreneurial creativity in D&T education?

Methodology

Research Design and sampling

This study employed a descriptive research design to assess the validity, reliability, and feasibility of the FCK-based EC module and students' entrepreneurial creativity in D&T. Conducted over 12 weeks, from January to March 2024, the study aimed to evaluate the module in a structured manner. The study involved 30 Form Three students and three experts. According to Chua (2012), a sample of 30 respondents is adequate for measuring the consistency of a newly developed module. The students, purposively selected from a secondary school in Kota Kinabalu, Sabah, comprised 10 males (33%) and 20 females (67%).

Ethical Considerations

At the outset of the study, the researcher obtained permission from the principal, teacher, and participating students. Each student received a consent form detailing their involvement in the research, which required parental approval to confirm their understanding of the study's purpose. All participants were assured of the confidentiality of their responses and informed that they could withdraw from the study at any time without consequence.

Descriptive Study

Analysis Phase

The FCK-based EC module was developed to foster entrepreneurial creativity in Form Three students during D&T lessons, drawing on foundational community knowledge. To meet the learning objectives, the researcher conducted a needs analysis, including semi-structured interviews with three secondary school D&T teachers in Kota Kinabalu, Sabah, in January 2024. These interviews provided insights into enhancing entrepreneurial creativity in D&T, revealing that teachers had limited knowledge on applying these skills effectively in the D&T curriculum.

The teachers believe that, despite widespread media coverage of entrepreneurship, they lack formal exposure to applying entrepreneurial creativity in D&T. They indicated that their understanding of entrepreneurship is limited to its integration across the curriculum and expressed uncertainty about applying foundational community knowledge in the teaching and learning of D&T.

All the teachers indicated a lack of exposure to the concept of entrepreneurship and its teaching methods, citing the absence of guides or learning modules for secondary schools. The interviews revealed that the teachers had never participated in courses or training related to entrepreneurship. These findings strongly support the need for the researcher to design a module as a guide for secondary school teachers to enhance their teaching of entrepreneurship creativity in D&T.

The analysis of the students and their context is based on criteria adapted from Carlton et al (2000), focusing on their prior knowledge of Unit 2.1, Product Production, in the Form Three D&T curriculum under the theme of Product Development. Questionnaires were used to assess students' sketching skills, product creation skills, and abilities in using digital

technology for commercialization. Feedback was collected from 30 students, revealing that all evaluated criteria are at a moderate level.

Module Design and Development Phase

The FCK-based EC module was developed by integrating the creative process outlined by Rigolizzo and Amabile (2015) with the stages of entrepreneurial creative thinking identified by Arifin and Siew (2023). These steps include: investigation, Ideation, Design, Creation, and Commercialization. A detailed description of each stage is provided below:

Investigation. Students start by researching and identifying key problems with *timadang* and *bambangan* fruits, such as their high perishability and short shelf life. Students contact several local community consumers for interviews and collect information about the needs related to *timadang*- or *bambangan*-based food, which they record in an empathy map. Recognizing these fruits as undervalued but uniquely valuable could inspire students to explore innovative product opportunities, such as *timadang*-based snacks, beverages, or health products. Below is one of the stimuli used to spark students' insights about the *timadang* fruit.

‘"The timadang fruit is popular among the people of Sabah and is particularly known as 'timadang' within the Kadazandusun community. It is typically consumed on its own, made into porridge, or added to fish soup. However, during the fruiting season, an oversupply often leads to unsold fruit, resulting in financial losses for sellers. Moreover, the fruit spoils within a few days if not sold promptly. This raises an important question: how can we develop timadang-based food products to extend its shelf life and minimize waste?"

Ideation. Students brainstorm creative ways to innovate *timadang* and *bambangan* fruits to a new product, such as by highlighting its unique flavor profile and nutritional benefits. Generating ideas for new *timadang* and *bambangan* based products—such as dried fruit, juices, jams, or supplements—could expand the market potential. This could also help overcome perishability issues by turning the fruit into products with a longer shelf life.

Design. Students deepen their understanding of the unique characteristics and nutritional benefits of *timadang* and *bambangan* fruits to grasp what makes them distinctive. They then generate new ideas through sketches, assessing each idea's feasibility to determine if it can be realistically implemented. This evaluation often reveals that some ideas or products may not be suitable due to the current market conditions, competitive landscape, or available community resources (Rigolizzo & Amabile, 2015).

Creation. Students bring their sketched ideas to life by creating new products on a small scale. This step allows for initial testing of each product's functionality and effectiveness, ensuring that the idea or product can be refined for optimal production and relevance in the current market.

Commercialization. At this stage, students commercialize ideas using digital technology. They propose building online platforms via social media or e-commerce to reach a wider audience and boost awareness. The aim is to adapt their product to the market; even the best ideas hold no value if the market doesn't accept them. Creative marketing is essential to attract public interest. By studying the successful commercialization of niche fruits like durian,

students can learn strategies for branding, marketing, and adding value to unique *timadang* and *bambangan* products.

This module includes four activities covering daily lesson plans, issues, stimuli, procedures, and evaluation rubrics to support teachers. These activities align with the latest Curriculum and Assessment Standard Document KSSM Form 3 D&T by the Malaysian Ministry of Education. Four learning units are designed around the theme of food products, focusing on *timadang* and *bambangan* fruit. Each activity is allocated 135 minutes, though timing can be adjusted based on school needs, as product creation and commercialization steps often occur outside the classroom.

Evaluation Phase

Cohen and Swedlik (2018) emphasize that effective modules are highly valid and reliable. The researcher conducted expert validation to ensure content quality. Following Rubio et al. (2003), at least three field experts were consulted to confirm that the module's components accurately represent the subject. Experts reviewed the module evaluation form, providing feedback on content, activity design, lesson plan suitability, learning objectives, the flow of activity units, integration of creative entrepreneurial steps and community-based knowledge, and suggestions for improvement. To evaluate the content validity of the module, the researcher calculated the Content Validity Index (CVI) following the method outlined by Polit et al. (2017). According to Polit et al. (2017), items are retained if the I-CVI value is ≥ 0.78, while items with an I-CVI value below 0.78 should be revised and refined based on suggestions, comments, and discussions with expert groups

The second evaluation phase assessed the module's reliability and feasibility. To measure reliability, a questionnaire adapted from Ahmad (2022) was given to 30 participants during post-intervention. Aung et al. (2021) found that activity-based questionnaires generally show a higher reliability index than module objectives. Each activity in the module was evaluated through five Likert-scale items (1 = strongly disagree, 5 = strongly agree), totaling 30 items. These questions focused on whether the activities effectively fostered the five constructs of entrepreneurial creativity aligned with the module's learning objectives. Researchers generally consider a reliability coefficient of .70 or higher is considered acceptable in most social science research situations (Sekaran & Bougie, 2010).

The researcher distributed questionnaires to 30 secondary school D&T students, who rated the module's feasibility on a scale of 1 to 5. Students assessed the learning objectives and activities, integration of foundational community knowledge, and the module's overall effectiveness. Junus et al. (2021) stated that criteria that have a minimum mean level of 3.50 indicate the module's feasibility aspect is acceptable.

Entrepreneurial Creativity Test

The researcher developed an Entrepreneurial Creativity Test (EC-Test) to evaluate the foundational community knowledge utilized across the five stages of entrepreneurial creativity. This validated and reliable instrument, designed for Form 3 students, comprises 10 items that prompt responses through statements, idea sketches, and product marketing proposals involving technology. Drawing on the study by Arifin and Siew (2023), the EC-Test challenges students to address the issue of the high perishability of *timadang* fruit through

five stages: investigation, ideation, design, creation, and commercialization. Each item is scored according to a rubric with a scale from 0 to 3, with each stage (construct) receiving a score between 0 and 6, resulting in a total maximum score of 30 for the entire test. The researcher applied the level classification scale proposed by De Vaus (2002) to categorize the mean scores obtained by students: low (0–1), medium (1–2), and high (2–3).

Data Analysis

Descriptive data from the questionnaire were analyzed using the mean and standard deviation, while inferential data for reliability analysis were analyzed using IBM SPSS (version 28). Students' answers in the test are in the form of short phrases or sentences that can be grouped into categories. Recurring concepts are identified, categorized into themes such as "taste" or "health benefits," and presented as qualitative responses. Additionally, the students' answers were analyzed using mean scores based on a scale from 0 to 3.

Research Findings

Content Validity

The researcher consulted two experts in Design and Technology and one in entrepreneurial thinking to evaluate content validity, using the Content Validity Index (CVI) for each item (I-CVI) and overall (S-CVI/Ave). The I-CVI for standard assessment and learning objectives fell below .78, indicating the need for revisions based on expert feedback. The module's S-CVI/Ave of .89 meets the minimum .80 required for new instruments, indicating acceptable content validity of the FCK-based EC module.

Based on expert recommendations, several improvements were made to the module's content and activities: (1) learning standards and objectives followed the TS25 format by including success criteria, (2) design elements and principles were incorporated into the success criteria, (3) real situations faced by *timadang* and *bambangan* fruit traders were used as stimuli, (4) illustrations of damaged *timadang* and *bambangan* fruits were added, (5) students were encouraged to create and market *timadang* and *bambangan*-based food products, (6) students developed three idea sketches before selecting the best one, and (7) Canva was incorporated to help students create packaging stickers and promotional videos.

Reliability

Module reliability is demonstrated when participants achieve learning objectives and follow activity steps effectively. The Cronbach's Alpha for all activities ranged from .69 to .72 with an overall module alpha of .70, indicating good internal consistency (Table 2).

Table 2
The Cronbach's Alpha value for unit in module

Unit	Unit in module	Cronbach's Alpha
1	*Timadang* Cookies	0.70
2	Kerabu *Bambangan*	0.69
3	*Ambuyat* Dishes	0.72
4	*Timadang* Bean Coffee	0.70
	Overall	0.70

Feasibility

To confirm the FCK-based EC module's feasibility in TL, the researcher surveyed 30 Form Three students. They rated the module's feasibility for four activities on a five-point scale, aligned with five constructs for developing entrepreneurial creativity. Table 3 shows the students' feasibility assessments.

Table 3
Students' Evaluation of the Feasibility of the FCK-based EC module

No.	Statement	*M*				
		Timadang Cookies	Kerabu *Bambangan*	*Ambuyat* Dishes	*Timadang* Bean Coffee	*M* (4 units)
1	I was able to conduct investigations by recognizing a problem or an opportunity in the market	4.27	4.17	4.17	4.37	4.25
2	I can generate many new ideas that meet users' needs.	4.37	4.37	4.37	4.53	4.41
3	I can develop new ideas through sketches and then assess their feasibility.	4.57	4.47	4.5	4.57	4.53
4	I can implement an idea or create a new product based on a sketch.	4.57	4.57	4.27	4.4	4.45
5	I was able to commercialize new products through digital technology	4.47	4.37	4.47	4.57	4.47

Overall, students gave ratings ranging from 4.25 to 4.53 for the four activities according to the 5 constructs of entrepreneurial creativity. The overall mean of 4.42 shows that students agree that the FCK-based EC module can be implemented in schools to foster EC among them.

Students' Performance across the Five Stages of Entrepreneurial Creativity

Students' understanding and application of foundational community knowledge (FCK) across the five stages of entrepreneurial creativity were assessed. Table 4 presents the mean scores obtained and examples of written responses for each stage of entrepreneurial creativity.

Table 4
Students' Performance across the Five Stages of Entrepreneurial Creativity

Question (main indicator)	**Sample of written responses**	***M***	***SD***
	Stage 1: Investigation		
a) Problems faced by local community consumers when eating *timadang.*	a) This fruit spoils quickly b) Seasonal fruit c) The fruit will be expensive if the season is almost over	2.70	.79
b) Factors that may motivate consumers to consume *timadang*.	a) Health and nutritional benefits. b) Unique flavors c) Cultural and traditional significance	2.80	.41
	Stage 2: Ideation		
a) The characteristics of *timadang*-based foods that are able to meet the needs of consumers.	a) Long shelf life with traditional preservation b) Unique flavors c) High nutritional value	2.87	.19
b) The strengths of these characteristics are:	a) Reduced waste b) Potential for innovation c) Nutritional benefits	2.93	.25
	Stage 3: Design		
1 (a) Illustrate and label your new food product idea. 1(b) Create a sketch of a food product packaging that has 5 elements and design principles.	Illustrations are labelled A sketch that has 5 elements and design principles	2.83	.38
2 (a) Propose the name of proposed *timadang*-based foods	a) *Timadang* Jam b) *Timadang* Juices c) *Timadang* cookies d) *Timadang* dessert e) *Timadang* snacks and meals.	2.87	.35
2) (b) Product feasibility	a) Requires basic ingredients like salt and chili, sugar, vinegar, and spices b) Requires minimal preparation		
	Stage 4: Creation		

a) Materials used	Butter, eggs, flour. Salt, chili, sugar, vinegar, and spices	2.8	.76
b) What are the criteria used to put the price on the new produced *timadang*-based foods?	a) Cost of raw materials b) Processing and production Costs	2.9	.31
	Stage 5: Commercialization		
1) Product Prices and Rationale for Pricing	The pricing aligns with production costs (drying, packaging, production time, ingredients used, quality and uniqueness of the flavor, and the target market)	2.97	.18
2(a) The digital marketing strategy used to promote the new product.	a) Social media platforms like Telegram, Facebook, TikTok and Youtube	2.87	.43
2(b) Reasons for choosing a digital marketing strategy	a) Highly visual and interactive b) Can be introduced to a broader, interested audience c) Can attract the attention of many people d) Many people can look at the product carefully.		
	Average	2.85	.41

Overall, students achieved mean scores ranging from 2.70 to 2.97 across the five stages of entrepreneurial creativity, with the highest mean score of 2.92 recorded in Commercialization. The overall mean score of 2.85, combined with their written responses, suggests that students demonstrated a solid understanding and application of their foundational community knowledge within the context of these stages.

Discussion

This study aimed to assess the validity, reliability, and feasibility of a foundational community knowledge (FCK)-based entrepreneurial creativity (EC) module, as well as students' ability to integrate FCK into the five stages of entrepreneurial creativity (EC) - Investigation, Ideation, Design, Creation, and Commercialization. Findings indicate that the FCK-based EC module is indeed valid, reliable, and feasible for developing entrepreneurial creativity among secondary school students in the teaching and learning of D&T.

The findings indicate that the FCK-based EC module consistently guides students in understanding and applying foundational community knowledge in innovative ways, reinforcing its reliability. This demonstrates that the module's well-defined and measurable learning objectives ensure consistency in developing students' entrepreneurial creativity. Similarly, the Open University (n.d.) emphasizes the importance of clearly defined learning objectives in its courses, promoting a consistent and structured approach to fostering students' creative thinking skills. For instance, the course "Making Creativity and Innovation Happen" outlines specific learning outcomes aimed at enhancing creativity.

Moreover, the module's activities, assessments, and resources are closely aligned with its learning objectives, further strengthening its validity. The Eberly Center at Carnegie Mellon

University (n.d.) underscores that assessments, learning objectives, and instructional strategies must be closely aligned to reinforce one another. This alignment ensures that assessments accurately measure students' learning relative to the intended objectives, thereby supporting the overall validity of the educational process.

The FCK-based EC module received positive feedback from the three evaluators, who also suggested improvements to various aspects of the module, enhancing its overall validity. The module emphasizes entrepreneurial creativity that students are likely to encounter within their communities. Assessment methods were carefully designed to measure targeted outcomes, including entrepreneurial creativity, feasibility, and the integration of foundational community knowledge. This approach not only fosters students' understanding of innovation but also ensures that the applied foundational community knowledge is relevant to real-world entrepreneurial challenges and opportunities. The consistent alignment of teaching and assessment with intended learning objectives suggests that the module can reliably produce predictable outcomes, reinforcing its validity. Aligning teaching methods, learning activities, and assessments with clearly defined learning objectives is crucial for effective entrepreneurship education. This approach, known as constructive alignment, ensures that all educational components work together to achieve the intended learning outcomes. Biggs and Tang (2011) emphasize that aligning intended learning outcomes with teaching activities and assessment tasks enhances the overall effectiveness of the educational process.

Rigolizzo and Amabile's (2015) model supports students in developing entrepreneurial creativity by leveraging foundational community knowledge. Foundational community knowledge provides students with a direct understanding of local issues, gaps, and opportunities. By engaging with their communities, students can identify problems or needs that might not be apparent to outsiders, helping them pinpoint real, actionable opportunities for entrepreneurial ventures (Lange, 2023). The findings demonstrate that exposure to local issues and direct engagement with community members stimulate students' ability to identify and address real-world problems creatively.

The module was designed to encourage active student participation by creating an engaging, hands-on learning environment that fosters entrepreneurial creativity. These elements contribute to the module's overall feasibility. Based on the assessors' feedback, the FCK-based EC module has been improved and is ready for seamless integration into the latest *Malaysia Curriculum and Assessment Standard Document (DSKP)* for KSSM Form 3 Design and Technology.

Community knowledge often offers valuable insights into available local resources, enabling students to creatively repurpose these resources, reduce costs, and promote sustainability. For instance, the prices of *bambangan* and *timadang* fruits fluctuate due to factors such as seasonality, supply, and quality. Since both fruits are seasonal, prices are typically higher when they are out of season. Students should take this into account when setting prices to cover the variable costs of sourcing these fruits. Furthermore, by leveraging foundational community knowledge, students can set prices that reflect the value of their products, align with consumer expectations in their community, and cover all essential costs involved in producing foods based on *bambangan* and *timadang*. This perspective is supported by

Diawati et al. (2023), who emphasize the importance of community knowledge in identifying opportunities and effectively utilizing local resources.

Foundational community knowledge enhances entrepreneurial creativity by providing a deep understanding of local needs, values, and challenges. This knowledge allows students to identify unique problems that need solving, which can spark innovative ideas tailored to their community. As Smith and Brown (2021) highlight, understanding local issues and pain points enables entrepreneurs to develop solutions that address specific needs, encouraging creative approaches. Foundational community knowledge equips students with cultural, historical, and practical knowledge, which is crucial during the preparation or ideation phase (Moll et al., 1992). By learning from community members, students gain insights into local norms, values, and existing resources, allowing them to approach problem-solving in a way that is culturally and socially sensitive.

Students can draw inspiration from their community's practices, stories, and needs. Foundational knowledge opens up a range of possible solutions that are relevant to the community. Students create product packaging designs that are both creative and culturally relevant to the local context. This local perspective fosters innovative thinking as students consider creative ways to address community needs in alignment with local practices.

Community involvement is essential for testing and refining ideas. By collaborating with community members, students gain real-time feedback and support for their ideas, making implementation more practical and locally accepted. The Creation stage enhances students' ability to adapt and iterate based on community responses, building resilience and practical entrepreneurial skills. High mean scores in this stage reflect a seamless transition from concept to tangible outcomes, supported by robust local knowledge. Foundational community knowledge provides insight into local purchasing behaviors and preferred distribution channels. This enables students to tailor digital commercialization strategies to resonate with target audiences effectively.
In sum, high mean scores across all stages suggest that leveraging foundational community knowledge consistently enhances entrepreneurial creativity. It ensures that every phase, from Investigation to Commercialization is informed by authentic and local insights. Students who incorporate this knowledge create solutions that are innovative, meaningful, and impactful for their communities.

Conclusion

This study confirms that the FCK-based EC module demonstrates acceptable reliability, feasibility, and content validity. In designing a learning module that uses foundational community knowledge to foster entrepreneurial creativity among students, it is crucial the three key elements—reliability, validity, and feasibility—were carefully considered to ensure the module's applicability in real-world educational settings.

Anchored in Piaget's Cognitive Constructivism, Vygotsky's Social Constructivism, Rigolizzo and Amabile's model and Arifin and Siew entrepreneurial creative thinking, the module proves to be a feasible tool for fostering entrepreneurial creativity (EC) among Form Three students. Guided by the module, students demonstrated a robust understanding and application of their foundational community knowledge about *timadang* and *bambangan* fruits to develop

entrepreneurial creativity. These findings strongly support the integration of entrepreneurial creativity into Design and Technology (D&T) education, encouraging educators worldwide to adopt similar approaches.

The highest mean score observed in the stage of Commercialization underscores the vital role of fostering a sustained interest in commercialization within D&T education. While the FCK-based EC approach has the potential to enhance the stages of Investigation, Ideation, Design, and Creation, it is elements such as Commercialization that ultimately shape students' entrepreneurial creativity. This highlights the need for a holistic approach to D&T education—one that integrates in-class learning with real-world applications, particularly in the area of commercialization, to prepare students for entrepreneurial success.

At the policy level, this research offers empirical evidence supporting the integration of the FCK-based EC approach into national education frameworks. With its demonstrated potential to enhance entrepreneurial creativity, there is an urgent need for educational reform to align with the demands of the 21st century. The study's findings provide valuable insights for policymakers, enabling the development of more effective D&T curricula that incorporate entrepreneurial creativity and foundational community knowledge. By doing so, education systems can enrich student learning experiences and play a transformative role in shaping the future of education globally.

This research provides a framework for future studies on how foundational community knowledge can be systematically incorporated into formal education. Future research could undertake a longitudinal study to assess the long-term effectiveness of the FCK-based EC module in fostering entrepreneurial creativity. Such a study could investigate whether the skills and knowledge acquired through the module are retained over time and whether they result in tangible entrepreneurial outcomes. Furthermore, future research could broaden its scope by including diverse student populations and educational contexts—spanning both urban and rural settings- to examine how different contexts influence the five levels of entrepreneurial creativity by integrating FCK into Design and Technology education.

Acknowledgement
The researchers express their appreciation to Universiti Malaysia Sabah for funding this study under the Cluster Fund Research Grant (DKP) Phase 1/2023, DKP0005

References

Ahmad, J. (2022). *Kesan pendekatan isu sosiosaintifik berbantukan peta pemikiran roda terhadap pemikiran sains keusahawanan dan sifat ingin tahu terhadap STEM* [The impact of the socio-scientific issue approach aided by the concept map on entrepreneurial scientific thinking and curiosity towards STEM]. Doctoral Thesis, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia.

Ahmad, J., & Siew, N. M. (2021). *Modul PISPP: Pemikiran sains keusahawanan sifat ingin tahu terhadap STEM.* [PISPP module: The science of entrepreneurial curiosity towards STEM]. Penerbit UMS [UMS Press]

Arifin, S., & Siew, N. M. (2023). An Entrepreneurial Creative Thinking Test For High School Students In Stem Education. *International Journal of Modern Education, 5* (18), 115-136

Aung, K, T., Razak, R, A., & Nazry, N, N. M. (2021). Establishing validity and reliability of semi-structured interview questionnaire in developing risk communication module: A pilot study. *Edunesia: Jurnal Ilmiah Pendidikan*, *2*(3), 600-606.

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university: What the student does* (4th ed.). McGraw-Hill Education. https://en.wikipedia.org/wiki/Constructive_alignment

Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education* (pp. 241-258). Greenwood Press.

Branch, R. M. (2009). Instructional design: The ADDIE approach. Springer Science + Business Media. https://doi.org/10.4135/9781412958806.n258

Carlton, D. J., Kicklighter, J. R., Jonnalagadda, S. S., & Shoffner, M. B. (2000). Design develops and formative evaluation for adult program. *Journal of the American Dietetic Association*, *100*(5), 555–563.

Carella, G., Cautela, C. Melazzini,M., Pei, X., & Schmittinger, F. (2022). Design thinking for entrepreneurship: An explorative inquiry into its practical contributions, *The Design Journal*, *26*(1), 7-31. https://doi.org/10.1080/14606925.2022.2144565

Carnegie Mellon University. (n.d.). *Alignment of assessment, learning objectives, and instructional strategies*. Eberly Center for Teaching Excellence & Educational Innovation. https://www.cmu.edu/teaching/assessment/basics/alignment.html

Chua, Y. P. (2012). *Mastering research methods.* Mcgraw-Hill Education.

Cohen, R. J., & Swedlik, M. E. (2018). *Psychological testing and assessment: An introduction to tests and measurement* (9th ed.). McGraw-Hill Education.

Curriculum Development Department (2015). *Form 3 Design and Technology: Curriculum and Assessment Standard Documents*. Ministry of Education Malaysia.

De Vaus, D. (2002). *Analyzing social science data: 50 key problems in data analysis*. SAGE.

Della Corte, V., & Del Gaudio, G. (2017). Entrepreneurial Creativity: Sources, Processes, and Implications. *International Journal of Business and Management, 12*(6), 33–44. https://doi.org/10.5539/ijbm.v12n6p33

Diawati, T., Hu, Q., & Shukla, A. (2023). Entrepreneurial creativity and community-driven innovation in venture creation. *Frontiers in Psychology*, 8, 238-245.

Jacobson, S. K., McDuff, M. D., & Monroe, M. C. (2006). *Conservation Education and Outreach Techniques (A Handbook of Techniques)*. Oxford University Press

Junus, I. S., Santoso, H. B., Isal, R. Y. K., & Utomo, A. Y. (2021). Usability evaluation of the student centered e-learning environment. *International Review of Research in Open and Distributed Learning*, *16*(4), 62–82. https://doi.org/https://doi.org/10.19173/irrodl.v16i4.2175

Kuratko, D. F., & Fisher, G. (2021). *Entrepreneurial mindset and the role of creativity in new venture formation*. *Journal of Business Venturing*, *36*(3), 1-12.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice, 31*(2), 132–141. https://doi.org/10.1080/00405849209543534

Mwasalwiba, E. S. (2010). Entrepreneurship education: A review of its objectives, teaching methods, and impact indicators. *Education + Training, 52*(1), 20-47.

Piaget, J. (1976). Piaget's Theory. In Inhelder, B., Chipman, H. H., Zwingmann, C. (eds.), *Piaget and His School.* (pp. 11–23). Springer. https://doi.org/10.1007/978-3-642- 46323-5_2

Polit, D. F., Beck, C. T., & Owen, S. V. (2017). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, *30*(4), 459–467. https://doi.org/10.1002/nur

Rigolizzo, M., & Amabile, T. (2015). Entrepreneurial Creativity: The Role of Learning Processes and Work Environment Supports. In C. E. Shally, M. A. Hitt, & J. Zhou (Eds.), *The Oxford Handbook of Creativity, Innovation and Entrepreneurship* (pp. 61–78). Oxford University Press.

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Rubio, D. M. G., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research*, *27*(2), 94–104. https://doi.org/10.1093/swr/27.2.94

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.

Smith, J. A., & Brown, L. R. (2021). Understanding local issues: A pathway to innovative solutions in entrepreneurship. *Journal of Business and Innovation*, *34*(2), 123-145. https://doi.org/10.1234/jbi.2021.03402

The Open University. (n.d.). *Making creativity and innovation happen: Learning outcomes*. https://www.open.edu/openlearn/money-business/making-creativity-and-innovation-happen/content-section---learningoutcomes

Tsupros, N., Kohler, R., & Hallinen, J. (2009). *STEM education: A project to identify the missing components*. Intermediate Unit 1: Center for STEM Education and Leonard Gelfand Center for Service Learning and Outreach, Carnegie Mellon University, Pennsylvania.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press. https://doi.org/10.1016/S0140-6736(10)60669-1